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Water Supply of Ships

A Discussion of the Water Furnished for Drinking Purposes and of the Methods of Sewage Disposal on Ships on Inland Waters

By Hugh de Valin*

THE fact that drinking water aboard vessels operating on the lakes and rivers of this country is frequently responsible for serious outbreaks of typhoid fever and diarrhea affections and the generally high incidence of these diseases among crews and passengers clearly demonstrates the immediate necessity for the promulgation of regulations and the adoption of efficient measures to control a situation which is of paramount importance both to the health of the traveling public and the commercial welfare of inland waterway transportation.

Of the outbreaks during recent years, probably the best known and most widely reported in journals and newspapers throughout the country was the one which occurred in the summer of 1907 on a big steamer of the great lakes. It is stated that during one short period of the summer's cruise 77 cases of typhoid fever developed as the result of the use of impure drinking water taken from the Detroit river. Surg. L. L. Lumsden, of the United States public health service, states, in his report of an outbreak among 1,200 passengers on a Mississippi river excursion steamer in 1912, that there occurred over 600 cases of diarrhea and 13 cases of typhoid fever with five deaths. Investigations by this service of similar outbreaks on three great lakes vessels during the summer of 1913 showed that out of a total of 750 people there were over 300 cases of diarrhea and 52 cases of typhoid with seven deaths.

The foregoing instances do not by any means give a proper idea of the annual number of cases of typhoid fever and intestinal diseases in which the infection is undoubtedly contracted aboard vessels, but are merely cited as being illustrative of the intensity of distinct outbreaks which may occur at any time as a result of the entirely too prevalent use of polluted drinking water on ships. When we consider that the records for the fiscal year ending June 30, 1913, show over 1,600 steam vessels operating on the great lakes alone, and that during this same period there were carried on these lakes over 16,000,000 passengers, it is easy to realize that our inland vessels may play more than a minor role in the maintenance of the country's high typhoid fever rate.

In reference to the incidence of typhoid among crews only, it may be stated that during the calendar year 1913 there were treated at the stations of the United States public health service in the great lakes region 144 cases of typhoid fever among seamen of lake vessels. The seasonal prevalence of diarrhea among lake crews is so common as to be looked upon by them as normally incidental to the summer's sailing. Though, of course, the roving life of a sailor exposes him to many sources of infection on shore, from such evidence as is available it may be concluded that a large proportion of the typhoid cases and by far the majority of diarrheal cases among them may be properly attributed to the use of sewage-polluted drinking water on board, the facts developed in the investigations of distinct outbreaks clearly bearing out this deduction.

The character of the drinking water supplied on board ships is chiefly influenced by the amount and extent of pollution of the sources of supply, the responsibility and care displayed in selecting the immediate source, and the vessel's water-intake system.

As to the pollution of our lakes and rivers, it is well known that this has become a serious question and one which is at present demanding the attention of federal, state and municipal health authorities. The recent sanitary surveys of the great lakes region by the international joint commission have demonstrated that sewage pollution of these bodies of water is yearly becoming more extensive and is proportionately lessening their value as a source of pure water supply. As these lakes are used as cesspools for the sewage of many cities and ships, the amount of pollution is naturally commensurate with the growth of these cities and the increase in shipping.

Undoubtedly there are numerous areas where pure raw water can be obtained, but the extent and concentration of pollution are so variable on account of wind, currents and other factors, that the customary lanes of travel and limited tank capacity too frequently necessitate a ship's taking water from areas of questionable safety. The effect of this variation in pollution was clearly demonstrated in the case of a vessel, the tanks of which were filled on one occasion when the vessel was about 4 miles offshore from Two Harbors, Minn. The water here is of good depth and generally of safe quality, but this time there happened to be a very strong offshore wind, and evidently sewage had been carried well out, as the subsequent use of the water pumped aboard resulted in a severe outbreak of diarrhea among the crew.

Not only is a ship exposed to city sewage, but to that from other ships as well. Vessels in going from port to port naturally take the shortest route, so there are definite lanes of travel along which an enormous amount of shipping moves. This means that not only are these pathways polluted with ship sewage, but that drinking water for ship use is being constantly pumped from the same areas.

The lack of responsibility and care so often displayed in selecting the

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time and place to get water, is probably more the result of habit and ignorance than of willful negligence. Formerly ships could secure good water almost anywhere, and the idea seems to persist that this can still be done, so that there is not the proper appreciation of the necessity for attention to the important details which the present-day conditions demand. If various municipalities have learned by costly experience with typhoid epidemics that not only must extreme care be used in the selection of intake points for water supplies but that in the majority of instances it is necessary to efficiently treat the water before it is safe for drinking purposes, it most certainly follows that ships on these waterways will experience similar trouble unless the same amount of caution is displayed.

Filling of Tanks

Where vessels operate on a definite schedule between ports, and their runs are short, filling tanks is routine duty and falls generally in a certain watch, so water is obtained at about the same place or places each trip. However, the demand for water naturally varies according to the number of people on board and is, therefore, very inconstant. If the runs are long or if the ship has no regular schedule for ports of departure and call, there will, of course, be a great variation in the sources of supply. Aboard most vessels it is the duty of the engineer's department to attend to filling tanks. Very often one man is designated for this duty and always looks after it, but on too many ships there is not only variation in source, but also in the one who selects the source. On more than one occasion tanks have been filled when the vessel was lying in harbor near some sewer outlet because water happened to be needed at the time and some incompetent or careless individual took it upon himself to start the pumps. Again, it has happened that although a safe source has been selected well out from shore, somebody has forgotten to close a valve or stop the pump and the ship has steamed into some foul harbor still pumping water into her drinking tanks. On practically no vessel is any record kept as to when or where tanks are filled, so there is nothing to show just who attended to this duty each time, or what places were selected as sources of supply during a cruise. Many captains and engineers are very careful about this important matter, but still lack of individual responsibility and display of incompetency are very common.

The intake system varies more or less according to type, size and class of vessel, but in general it may be stated that drinking water is pumped through a sea cock in the ship's bottom to the tanks and delivered from the latter by pipes to drinking points. On some ships there is a separate intake, pump and pipe line for drinking water, but on by far the majority the sea cock, pump and main line are used for various purposes, the pipe line to the tanks being a lateral from the main line and closed by a valve when not in use. On most of the freighters and on some passenger vessels the tanks are filled by connecting a hose to the deck line, the tanks having no pipe connection except for delivery of water to drinking points.

As stated above, the intake system is frequently used when water is needed for purposes other than drinking, such as boiler supply, washing down decks, fire control, flushing toilets, filling water-ballast tanks, etc. When lying in port, water for any one of these purposes may be more or less constantly pumped aboard, and if the harbor happens to be grossly polluted with sewage, as practically all of them are, the sea cock, pump and pipes must certainly become thoroughly fouled with all sorts of filth. The following extract and diagram from the article "Water Contamination aboard Ship and Its Prevention" (Journal of the American Medical Association, Dec. 18, 1909, by Surg. J. O. Cobb, United States public health service), graphically illustrates this point:

> All water used aboard, for whatever purposes, is pumped through the sea cocks which perforate the shell of the ship in the bottom, as indicated by the arrow in the diagram, which represents a cross section of a ship, the sea valve, pony pump, and pipes to drinking tanks. Now, suppose that valve A is kept closed when not in use, which is never the case except when the boat is laid up for the winter, then when the ship lies in the Chicago river, say, all that portion of the piping and sea cock from the bottom of the boat to valve A stands filled with sewage, or Chicago river water, which is the same. But let us go further: Suppose that the boat is loaded down so she lies in the water to the depth indicated by B, then the river water would rise through the sea cock to the level of B at C. From the sea cock to the pony pump is a long stretch of pipe in most steamers, and as the pony pump is constantly in action to maintain the pressure in the various pipes and to feed the boilers it is plain that all this section of pipe is filled with sewage all the time that the boat lies in foul water.

Where there is direct pipe connection with tanks, if the valve which closes the tank lateral happens to be left open or is poorly seated, some of the sewage water, which is being pumped through the main, will be forced past the valve and into the drinking tanks. It will be stated on board ship that before filling tanks the intake system is flushed with clean water, but even if this be done—which is not always the case—most certainly the mere washing is not a sufficient surety for the removal of filth and pathogenic bacteria, so that there is always the danger of polluting the drinking water even though the source may be absolutely safe. Obviously an intake system any part of which is liable to sewage pollution is unfit for service if raw water is to be used for drinking purposes.

The water tanks are variously placed —in the hold, forward, aft or amidship, or on any one of several decks. They also vary greatly as to number and size, according to the ship they are on, there apparently being no definite scale or standard. As to condition, that varies as much as the tanks themselves. Aboard some vessels they are never cleaned, while on others this is attended to frequently and carefully, steam being often used for the purpose. On some vessels the water supplied to toilet room and cabin faucets for washing purposes does not come from the drinking tanks, but from directly overboard, irrespective of where the ship may be lying. From an esthetic standpoint alone, water out of a dirty harbor seems scarcely the proper thing for cleansing one's face and hands or for washing one's teeth, but, what is still worse, passengers, through ignorance of the source of supply, not infrequently drink from these faucets.

As to the best way to handle the question of drinking water on board vessels taking their supply direct from our inland waters, there are a few measures which if properly carried out will solve the problem without difficulty.

Extensive Pollution Exists

Extensive pollution of our inland waterways exists and can not be controlled or limited by the ships themselves except in a comparatively slight degree. In regard to the responsibility and care in the selection of immediate sources, however, something can be done. There should be some one on board, preferably an officer, whose duty alone it should be to have charge of filling tanks—this to be done only by his orders and under his supervision—and to make an official entry in the ship's log stating the time and place where tanks were filled. Though existing conditions prevent absolute certainty as to safety, it should always be endeavored to select places which are known to be free from pollution, and obviously polluted areas, such as harbors and rivers into which sewage is emptied, should be avoided. However, though these precautions will aid materially, it may be stated emphatically that if the supply is tak-

en on board direct from lakes or rivers absolute safety can be assured only by efficient treatment of the water before it is used for drinking purposes.

There are a number of methods of water purification which are recognized as being efficient, but mechanical construction, cost of installation and operation, desired amount of supply, and many other factors will greatly influence their practical applicability to ship use. Some method which can be easily applied, which is not too expensive, which is efficient, and which does not have to depend to any great extent on the human element for operation, should be selected. There is no better purifier of water than heat, and as it is available on practically all vessels, some form of apparatus which uses this as the active principle would be the most feasible. A distilling apparatus meets all requirements, but it is not necessary to distill water in order to render it safe—boiling is sufficient, and there are several devices on the market which operate on the latter principle and are constructed for ship use. The ordinary engineer could no doubt devise some scheme of his own whereby the water would be raised to the proper temperature either before going to the tanks or before delivery to drinking points. Practically automatic operation, however, is a very necessary requisite, in order to avoid the possibility of carelessness or negligence on the part of some one.

Ozonization is a method which is rapidly coming into general use and there are various satisfactory ozonizers made for application to ships' water supplies.

Filters Condemned

Filters are to be condemned. Though many accomplish mechanical cleansing, very few can be depended upon for the constant and complete removal of harmful bacteria, and those types which are efficient are not constructed to meet the demands of a vessel's water supply. The sand and gravel type of rapid filter is frequently seen aboard ship, but though applicable to municipal use, the manufacturers themselves admit that filters of this class for ship use cannot be depended upon always to deliver safe water. For one thing, frequent cleaning is necessary and this is a precaution which can very easily be neglected so that often the filtered is much more dangerous that the raw water.

As to the method of intake now in general use, though no doubt objectionable, it is not directly harmful if the water is properly treated before it is used for drinking purposes. If the water is not treated, the method is decidedly dangerous and should be abandoned. Under any circumstances, a change should and can be easily made. A separate intake device, which can be raised above the water line when not in use and so be free from pollution while in harbors, and a separate pump and pipe line to be used for filling tanks only, would meet the necessary requirements.

The practice mentioned before of taking water from directly overboard for personal toilet use should be abandoned, as it exposes crews and passengers to the danger of infection. People cannot be depended upon to stop and inquire if this or that water is intended for drinking, so it is imperative that no water, unless it comes from the drinking water system, be accessible for this purpose.

Water from Municipal Supplies

One of the best ways for vessels to avoid the dangers of uncertain sources and of contamination by faulty intake systems is always to get their drinking water from the municipal supplies in the ports visited. Most of our large cities have adopted measures to provide safe water and ships can easily take advantage of the opportunities thus afforded. Such things as tank capacity, number of people carried, length of trips between ports, etc., must be taken into consideration, but no doubt many vessels will find that the cheapest and easiest way to solve the problem will be to so increase their tankage that they can depend solely on municipal supplies for drinking water. There will then be no necessity for communication between sea cock and tanks, as the latter can be filled by attaching hose to city connections on the water front.

There is another question which has a direct bearing on the one of pure water supply, and that is the disposal of ship sewage. The present practice is to discharge all sewage from toilets directly overboard. Though the point that the amount of general pollution of waterways by ships is small in comparison to that by cities is well taken, it cannot be denied that in many instances sewage from ships may do a great deal of harm. As mentioned before, there are certain definite lanes of travel up and down which hundreds of ships pass, discharging their sewage as they go, so that the possibility of a ship taking on human filth along with her drinking water, if she happens to be following fairly close in the path of another vessel, is not so remote as one might suppose. Aside from the danger to one another, the promiscuous discharging of sewage by ships is very often a decidedly grave danger to cities. In the case of some of our lake cities, the water intakes are so placed that ships frequently pass very close to them. It can be readily seen that a large vessel coming into port with several thousand people aboard may cause highly concentrated pollution of the area from which the city draws her drinking water. In Chicago, at least, this danger has been recognized and the health department is requiring vessels which use this port to install carrying devices, so that no sewage may be discharged within a certain distance of the intakes or while in harbor. Sewage tanks are being installed on the ships of one of the Chicago lines. Each tank accommodates one, two or three toilets. Their capacity is rather limited—the largest being only 12 x 44 inches—and, therefore, necessitates frequent emptying. They are designed as temporary carriers only, the raw sewage to be discharged when the ship is out in the lake, and by no means meet the proper requirements, but they are at least a step in the right direction. There is ample steam on most vessels, so that a tank or tanks somewhat of this type could no doubt be devised in which steam could be used as the sterilizing agent and the sewage efficiently treated before discharge, thereby doing away with any danger irrespective of the place of ultimate disposal.

Sewage Disposal on Ships

From the foregoing facts and statements relative to water supply and sewage disposal on ships, it may be seen that the present existing conditions can be improved with comparative ease if proper co-operation and effort are made by the shipping people. The question of ship sanitation is important not only from a public health standpoint, but from a commercial one as well, for the public at large is beginning to take a genuine interest in such matters, and the companies affected by the outbreaks mentioned in this article can vouch for the fact that a ship which exposes her crew and passengers to unnecessary dangers receives unenviable advertising.

The new municipal ferry boat, William J. Gaynor, was launched from the yard of the New York Ship Building Co., Camden, N. J., on Feb. 7. She is 330 ft. long, 54 ft. beam and is fitted with triple-expansion engines and Babcock & Wilcox water tube boilers.

Pollution of Lake Waters

A Lake Manager Outlines the Instructions Which He Has Given to the Masters of His Fleet Based on Dr. McLaughlin's Report

EDITOR MARINE REVIEW:—I was extremely pleased to note that you had given Dr. McLaughlin's report on the pollution of lake water such prominence in the February REVIEW. I consider that this question, in so far as the general shipping of the lakes is concerned, is of even greater importance than that of life boat equipment, and so far as freighters are concerned, completely overshadows it. Life boat capacity and manning, in their case, is almost without exception much in excess of requirements. In the case of passenger ships almost every passenger may be said to be exposed to risk from impure drinking water, but not one in a hundred thousand of those transported on the lakes is endangered through circumstances requiring life boats. I do not wish to be understood as advocating a relaxation of vigilance and care as to life saving equipment, but rather as using it to emphasize the importance of the subject of pure water. The one is always with us; the other, fortunately, seldom.

For some years we have, in our fleet, urged upon masters and engineers the need of caution as to water supplies and within two years have practically doubled the tankage to insure supply during protracted port delays, but I confess the information set forth by Dr. McLaughlin has fairly staggered me. Learning of this report early in January, I took steps to familiarize myself with its disclosures and recommendations and immediately set on foot measures to guard, as far as possible, with the time and means available, against the dangers set forth. Based on Dr. McLaughlin's report I have prepared instructions and suggestions for our masters and engineers which are given in full below.

Effort at Amelioration

The report does not treat of Lake Superior to the westward of the International boundary, nor of Lake Michigan, but with the information at hand it is easy to deduce conditions over those areas. It is not claimed, nor indeed supposed, that these instructions are final, nor the best possible, for all services, nor yet that circumstances may not arise to compel violation, but they do at least represent a conscientious effort at amelioration.

As to source of supply and means of distribution: a separate small sea-cock (1½ in.) is being fitted in engine room 4 ft. below the light water line. This can be installed without docking the ship. A steam connection is fitted to this sea-cock between the valve and the skin, therefore the fittings should be brass or their life will be short because of electrolytic action. This steam connection is for thoroughly boiling out the sea connection before opening the sea-cock and preventing infection from foul water of harbors or polluted areas. This sea-cock will be locked and the key in charge of the master only. The only outlet is to a small pump which has no other connection on suction side and delivers only to a tank-filling service. In our case we prefer to fill with a 1-inch hose which cannot be used for any other service because there is no other hose connection on the ship of similar size. Similarly it avoids risk of tank filling with the regular deck hose. The location of sea-cock should be chosen with some care and with reference to soil pipe openings forward. It usually will be found possible to avoid a direct wake.

When tanks are to be filled, the master, having determined a safe area, will give or send the key to engine room with orders to furnish water. The engineer on watch will personally see the sea-connection boiled out for at least five minutes before opening the sea-cock and starting pump. The sea-cock can only be locked in the closed position. Of course a suitably designed handle or spanner, removable only in the closed position, as common in certain lines of work, would answer, and perhaps be better, but these things take time. The key is to be returned to the master after filling is completed. We are also adding still further to our tank capacity. It is standard practice with us to thoroughly clean these with a lye or caustic solution at intervals and flush out all service connections with a similar solution before refilling.

No Division of Responsibility

There should not be any possibility of divided responsibility in a matter of such importance and we believe the master should not under any circumstances delegate the water supply to a subordinate. The health of the crew is of just as much importance as the ship or her cargo.

Absolute security could be attained by boiling the water as taken aboard and this can be done with an injector by throttling the discharge opening, in which case water could be drawn from the usual service sea-cock, but a separate filling line would still be needed to prevent contamination after passing the injector. Other objections, not by any means unimportant, also suggest themselves.

Pure water can also be obtained by the use of evaporators or distillers, but the water so obtained is unpalatable and the apparatus requires constant care, and with such large areas of safe natural water available their use does not seem advisable, especially as any interruption in operation would result in falling back upon ordinary sources of supply.

There remains the question of contamination by ice and tainted drinking vessels or containers.

Artificial Ice

As to the first, it is almost entirely avoidable. Few towns or cities of importance are unable to supply artificial ice, which, while generally not quite so durable or efficient as natural, because of the relatively high temperature at which it is frozen, generally not below 26 to 28 deg. Fahr., is pure, unless made on the plate system, in which raw water is generally used. In the can system generally employed, however, the ice is made from distilled and reboiled water and is as nearly pure as anything handled or produced in the open air can well be. In our own practice the use of natural ice is prohibited, but our ships trade only to ports where artificial ice is always available. At all events, if any port of importance is without an ice plant a demand will soon produce it.

A 1½-ton refrigerating machine will make 1,200 lbs. of ice per day and refrigerate the usual provision rooms found aboard freighters. The fuel expenditure will amount to about 300 lbs. per day. It entails considerable, however, in extra equipment and attention and is undesirable aboard ship unless no other source of supply is available. Ice making is an en-

tirely different thing from refrigeration as so frequently now fitted in modern ships. Tainted drinking vessels are avoidable by frequent boiling or discarding, and the use of water buckets in fire holds should be discouraged as far as possible, but even these can be easily sterilized by boiling out with the steam hose found in every stokehold. If the crew once become impressed with the need of caution for their own sake they will, I am sure, not be obstructionists.

The unsafe areas designated below have, of course, reference to the courses and ports used by ships of our fleet.

Manager.

To Masters and Chief Engineers

The report of the International Joint Commission on pollution of the waters of the great lakes discloses a degree of pollution totally unsuspected and, over extensive areas, highly dangerous. These areas are largely affected by concentration of floating traffic and by winds distributing sewage off shore.

The health and welfare of the officers and crews is a matter of deep concern to the management and with a view to guarding against contaminated supplies the following areas are to be considered as prohibited. The health of the crew is fully as important as the safety of the ship and her cargo and the supervision of the water supply will be the care of the master exclusively and cannot be delegated to anyone. Isolated sources of supply and distribution have been or will be provided and under no circumstances will the tanks be filled from or through any other.

Natural ice is not to be taken aboard under any circumstances unless artificial is unobtainable, and then only when its source is known and satisfactory and in quantity only sufficient for immediate needs. No ice is preferable to a supply of doubtful quality. Ice boxes should be thoroughly scrubbed out after any such supply.

Drinking vessels used in common should be thoroughly boiled at frequent intervals or discarded, and the use of water buckets as containers for drinking water should be discouraged as far as possible. When used in fireholds they should be boiled out frequently with the steam hose.

Water tanks are to be thoroughly scrubbed out with a strong caustic solution at least once a month, and the solution drained and flushed away through the distribution service. Except in case of fire, buckets or other vessels are not to be dipped into tanks, and every effort is to be made to keep them free from contamination.

In taking water, masters will exercise due caution with regard to ships ahead and haul courses if necessary to clear their wake.

The question of pure water is of vital importance and the report referred to provides an authoritative explanation of the numerous outbreaks of typhoid and other diseases afloat as well as ashore in the affected areas.

Neglect of these precautions, of which the entire crew should be kept advised, may have serious consequences, and, for their own interest, all should, and it is to be hoped will, co-operate as far as possible.

The following areas will be strictly avoided as sources of supply:

Lake Superior

Duluth to abreast Two Harbors and with or after S. W. to N. W. winds Duluth to abreast Sand Island.

Soo River and Approaches

Whitefish Point, Lake Superior, to abreast Spectacle Reef, Lake Huron.

Lake Huron

Fifteen miles outside Ft. Gratiot light. With or after strong W. to N. W. winds Pt. Aux Barques to St. Clair river unless at least 10 miles off shore.

Lake Michigan and Straits

West or south of a point at least 12 miles off Milwaukee on Pt. Betsey course. With S. to N. W. winds, 25 miles off Milwaukee. Beaver Island to Spectacle Reef. If following west shore at least 10 miles off shore. With fresh S. E. to N. E. winds water may be taken *under necessity only* between Milwaukee and Chicago not less than 10 miles off shore.

River and Lake St. Clair and Detroit River and Approaches

Fifteen miles above Ft. Gratiot light to 12 miles east of Southeast Shoal lightship. With or after brisk S. W. to N. W. winds, to 25 miles east of S. E. Shoal.

Lake Erie

Entire westerly end of Lake Erie to east of S. E. Shoal, as above. Pt. Abino to Buffalo. At least 6 miles off south shore and with or after S. to S. W. winds at least 12 miles. Area south of a line drawn from Kelley's Island to 12 miles off Erie is unsafe at any time.

The foregoing areas are designated with reference to existing or probable courses used by the ships of this fleet.

Running in Fog

Judge Tuttle, of the United States district court of Detroit, in rendering a decision in the colision between the steamer W. A. Rogers, owned by the Niagara Transit Co., and the tug Security and oil barge No. 86, owned by the Standard Oil Co., in which he divided the damages, devoted considerable attention to the practice of running vessels in a fog. On this point Judge Tuttle said:

"There isn't any question of fact for a court to determine which is any more difficult to determine than a question of speed on the water. In the first place, with reference to the speed of either of these boats the court is limited almost entirely to the interested parties aboard that particular boat. We have that, and we have the manner in which the boats came together to assist the court, and I do not know as the court would be in error if it took something else into consideration; courts do take into consideration the fact they know the witnesses on certain ships have for years taken an interest in their particular ship, and they always swear together.

"In every case it is 'profit first', and the captain who can make a quick trip through a fog and not strike a boat gets an advance for the next year; but the fellow who tries it and strikes a boat is not a good captain. But it is well known—whether the court ought to know it or not—by every vessel owner, and by every captain and by every court, and these vessels are expected to and do run these fogs at a faster rate than the law and rules permit. It is well known. We all know it, and the captain of the Rogers was frank enough to state it in his testimony that that is what is expected of him. There isn't any one other violation of any other rule that in the years that are normal and average on the lakes that causes more loss of property and loss of life than the violation of that rule about running too fast in a fog. And there is no other rule more uniformly violated on the lakes than that rule. It is done with the knowledge of the owners, because they want it done and they expect it to be done. But it is against the law, it is against the rules, and if they want to take the chance and run the risk of a lawsuit, they must suffer the consequences. The Rogers for an hour coming through that fog was violating the law and the rules every minute, and knew it, and the owners would approve of it, and if the captain had not done that he would not have been considered a good captain. Someone has got to suffer for that."

Shipping Machinery Knock-Down

Difficulties and Annoyances Experienced in the Delivery of Marine Machinery by Customers in Foreign Countries

By W. F. Barnes

THE average seller of machinery for export seldom has any idea of difficulties the purchaser has to contend with in the delivery of his machinery to the place where he expects to operate his boat. Imagine, if you can, receiving a piece of machinery which is too large or too heavy for transportation by mule back or on the back of oxen—or that is too large to go through a tunnel or a cut on the railroad. These things would seem to us to be impossible in our own country, but our neighboring countries in the southern hemisphere have all of these things to contend with and a great many others, such as the washing away of the railroad by mountain torrent or floods. A customer of the Marine Iron Works, Chicago, lately had an experience that would dishearten most any North American contractor. This man, when ordering the machinery for a boat and a knock down steel boat 65 ft. long, was not confronted with very many difficulties regarding the delivery. However, while the shipment was en route a mountain torrent washed away the railroad in sections to such an extent that it would take over a year to get the entire system again in operation. When the shipment arrived it was necessary for him to take the machinery apart into the smallest pieces possible, to cut out the rivets in the boiler, removing the dome, furnace and tubes. At some places along the route they were obliged to fell trees across the streams so that the heavy pieces could be rolled or carried across. This shipment, when it arrived at destination, was reassembled and put together, the boiler being riveted up with pieces of round iron made into rivets. The machinery was successfully reassembled and the boat put in operation. The shipment of the boat in the knock down shape convinced the buyer that it was the only way to have shipments sent to him, as in that condition they are able to transport it easier and with the supplies and extras for again setting up the work a great many of the transportation difficulties are overcome. The illustrations which are here shown give a fair idea of some of the difficulties of the trans-

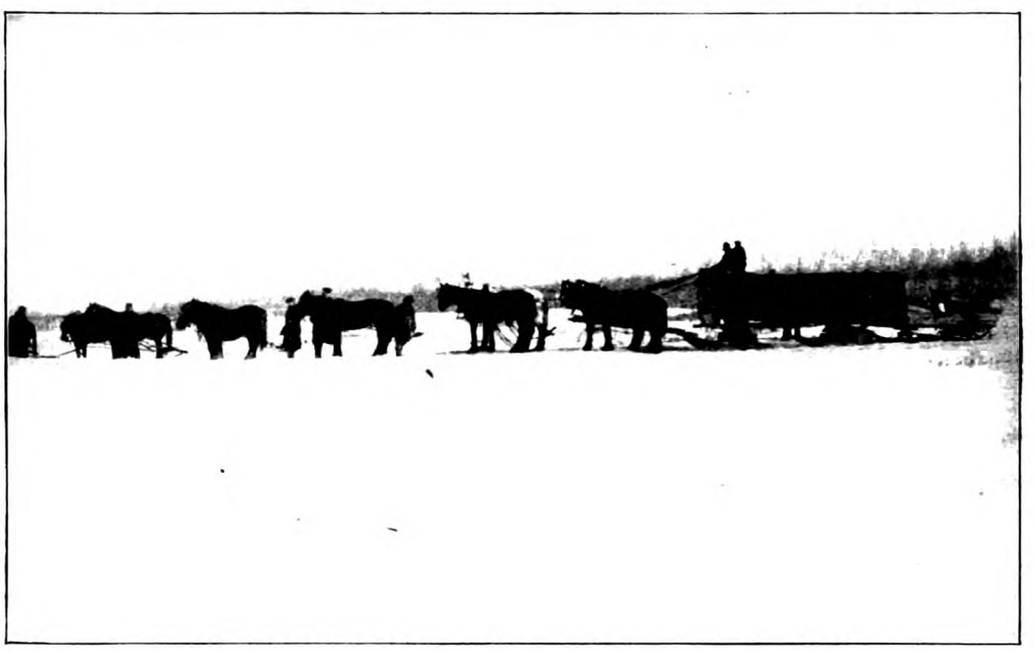


FIG. 1 — FIVE TEAMS OF HORSES WERE NECESSARY TO HAUL THE BOILER

FIG. 2—SHOWING THE TEAMS AND SLED IN THE WOODS

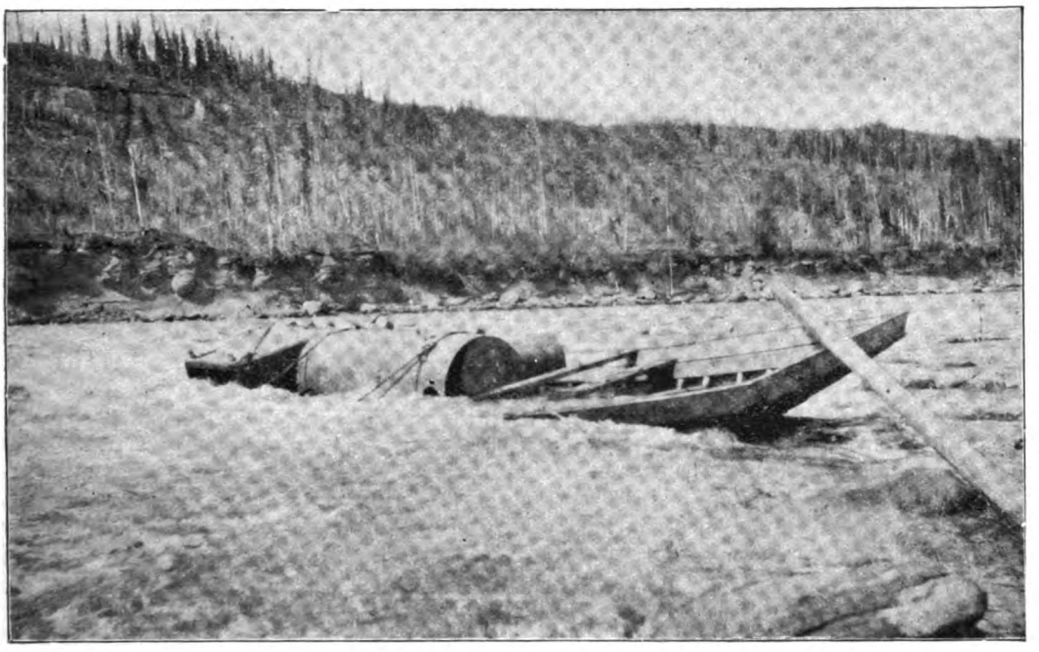


FIG. 3—THE CANOE AND BOILER ON THE ROCKS. THE CANOE WAS ENTIRELY DEMOLISHED

portation of machinery and boats in countries nearer home. This outfit started out from the Marine Iron Works loaded on cars and traveled to the nearest railroad station to destination. It was then carried on sleds a distance of over 100 miles to where it could be transported in canoes. These canoes had to be built to transport this shipment. During the transportation by water the shipment had to be unloaded six different times and portaged around rapids and falls necessitating the carrying of the goods by hand around the falls.

As some of the rapids were fairly easy to navigate, the canoes were sent down them; they, however, took the precaution of having a rope run to the shore in case of accident. That this precaution was a wise one can be seen from the picture, Fig. 3, showing the canoe on the rocks with the boiler. In this instance the canoe was entirely demolished. The boiler, however, was saved, pulled ashore, a new canoe built, boiler loaded into it and delivery finally made. The only loss occurring in the delivery of this outfit was a keg of rivets. In the 20 years that the Marine Iron Works have been building and shipping machinery and boats to foreign countries, such as Africa, Russia, China, Argentina, Peru, Chile, Bolivia, Brazil, Ecuador, U. S. of Colombia, Nicaragua, Panama, Honduras, Mexico, Hawaiian Islands, Philippines, the northwest territory and Alaska, they have been obliged to assist the purchaser in every way possible in this transportation problem by building machinery and boats that could be shipped in package, some of which could not weigh over 60 kilograms, or where the pieces could not be over 9 meters long. That they have met these propositions for their customers is well demonstrated by the large business they are receiving. An axiom of their business is to pack the articles well and according to the way and size the customer desires and always to send an extra supply of the small parts required, such as rivets, bolts, nuts. It costs but a few cents for these extras, but their customer may be thousands of miles from his nearest supply. To find himself short of them is likely to have him condemn a good outfit simply on this account. If there are plenty, you will hear from others interested in this class of work, for a good oufit with plenty of supplies is the best of advertisers.

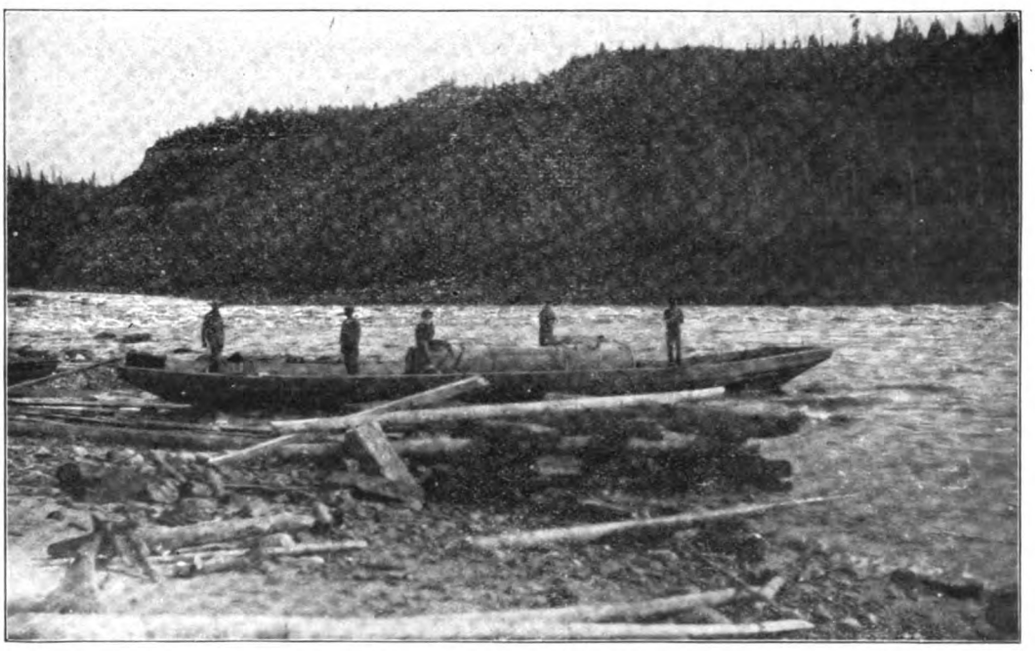


FIG. 4—NEW CANOE BUILT AND BOILER ON BOARD AGAIN

Coal Plants

The Hunt Construction Co., of New York, has been awarded contract by the Isthmian Canal Commission for the installation of coal handling machinery at Cristobal and Balboa, canal zone. Four unloading towers will be installed on the Cristobal docks on the Atlantic side and two on the Balboa docks on the Pacific side. The total cost of the installation will be $1,833,127. The towers will travel on rails and will deliver the coal from the vessels and deposit it in the hopper built in the tower, where it may be delivered through chutes to cars or into stores. The installation will also include stocking and reclaiming bridges.

Ship Building in Great Britain

The Year 1913 Witnessed the High Water Mark of Ship Construction—A Very Notable Performance

IT IS a rather far cry to the ancient Republic of Venice, but it is to be noted that when she was mistress of the seas her great shipbuilding arsenal, employing 16,000 men, could, and did, turn out a ship a day for a period of 100 consecutive days. Some performance that for times that were neither industrial nor commercial according to modern standards, and it records the high water mark of production for medieval times. The tonnage was undoubtedly light, according to present standards, but the achievement was nevertheless prodigious. Last year, however, established the record of shipbuilding for all periods—ancient, medieval or modern. In great Britain alone last year 1,381 mercantile vessels of nearly 2,000,000 tons register were waterborne, exclusive of warships and government tonnage aggregating 300,000 tons.

Nor did this program tax the yards of Great Britain. It was in fact achieved against numerous obstacles, because no country suffers more from scarcity of skilled labor and broken time than Great Britain. The output marks the culmination of the period of high freights which set in in oversea commerce in 1910 and continued in an ascending scale until the late summer of 1913, when it began to recede, leaving vessels in the stocks building at high prices for which there will be no market when they are ready to go into commission. There were 513 vessels on the stocks in Great Britain on Dec. 31 last, aggregating 1,956,606 gross tons, which was 30,000 tons less than that which was in hand at the close of the preceding quarter, and 15,000 tons less than that building in December, 1912.

It is quite certain that there will be a perceptible slackening in output in 1914 in sympathy with the fall in freights. However, there is nothing in the situation to be discouraged over, as it was not expected that the rich harvest could last forever. Ship owners have done very well in oversea trade during the past three years and should be content with fair picking for awhile. The present situation is to be regarded as one of the phases of the cycle of trade.

THE 1913 OUTPUT OF BRITISH SHIPYARDS.

District	1913 No.	1913 B. of T. Tons.	1912 No.	1912 B. of T. Tons
The Clyde	335	688,542	353	587,743
The Forth	23	19,519	22	18,063
The Tay	10	18,157	9	12,233
The Dee	101	14,849	47	9,608
Total, Scotland	469	741,067	431	627,647
The Tyne	96	361,013	88	317,497
The Wear	79	303,108	82	325,561
The Hartlepools	33	153,089	30	122,300
The Tees	62	158,439	71	146,813
The Humber	106	53,538	131	52,723
Total, N. E. Coast	376	1,029,097	402	964,894
The Thames	86	9,068	47	5,630
English East, West & So. Coast Outports:	430	66,510	322	63,814
Ireland	20	130,475	21	163,798
Gov. vessels (mostly displ'mt tonn'ge)	85	294,905	69	287,861
Total	1,466	2,271,122	1,292	2,113,644
1913 Increase over the previous Record Year of 1912		157,478		

* *

Shipbuilding produced throughout the world in 1913 is summarized as follows:

	1913	1912	
United Kingdom	2,271,122	2,113,644	+ 157,478
British Colonies	54,179	35,181	+ 18,998
Foreign Countries	1,977,708	1,679,365	+ 298,343
Total Output	4,303,009	3,828,190	+ 474,819

MERCHANT TONNAGE LAUNCHED IN THE UNITED KINGDOM DURING 1913

ENGLAND: THE NORTH-EAST COAST.

Names of Builders.	1913 No	1913 Tons	1912 No.	1912 Tons
THE TYNE.				
Swan, Hunter & Wigham Richardson, Ltd., Wallsend and Walker	18	92,514	15	784,05
Northumberland Shipbuilding Co., Ltd., Howdon, Willington Quay	12	54,343 [63,400]	12	53,255
Palmers Shipbuilding & Iron Co., Ltd., Hebburn and Jarrow	8	50,812	6	31,902
Sir W. G. Armstrong, Whitworth & Co., Ltd., Elswick and Walker	6	38,383	8	41,535
R. & W. Hawthorn, Leslie & Co., Ltd., Hebburn	5	35,146 [36,100]	5	35,318
John Readhead & Sons, Ltd., South Shields	8	33,007 [38,318]	6	26,231
Tyne Iron Shipbuilding Co., Ltd., Willington Quay	4	17,141	3	11,537
William Dobson & Co., Low Walker	4	12,089 [13,064]	4	12,230
Wood, Skinner & Co., Ltd., Bill Quay	6	8,136	5	10,045
Jos. T. Eltringham & Co., South Shields and Willington Quay	8	2,398	5	1,029
J. P. Rennoldson & Sons, South Shields	6	1,615	8	2,230
Hepple & Co., Ltd., South Shields	5	550	7	758
Blyth Shipbuilding & Dry Docks Co., Ltd., Blyth	6	14,879	4	12,215
Totals	96	361,013	88	317,497
THE WEAR.				
William Doxford & Sons, Ltd., Pallion	9	50,086 [63,854]	18	92,482
Joseph L. Thompson & Sons, Ltd., North Sands	9	41 416 [52,094]	8	37,749
Short Brothers, Ltd., Sunderland	6	29,197 [33,217]	6	32,731
Sir James Laing & Sons, Ltd., Sunderland	5	27,094 [28,244]	5	23,538
Bartram & Sons, Ltd., South Dock	5	22,040 [26,895]	5	22,856
John Blummer & Co., North Dock	7	22,025 [25,065]	5	15,973
Wm. Pickersgill & Sons, Ltd., Sunderland	5	21 604 [25,201]	4	13,783
John Priestman & Co., Castletown	6	21,270 [25,703]	5	19,055
Sunderland Shipbuilding Co., Ltd., South Dock	5	20,178 [22,729]	7	24,078
Robert Thompson & Sons, Ltd., Southwick	5	17,134 [20,877]	6	19,221
Osbourne, Graham & Co., Hylton	8	11,958 [12,744]	6	11,408
S. P. Austin & Son, Ltd., Wear Dock	5	11,667	4	8,420
John Crown & Sons, Ltd., Strand Slipway	4	7,439	3	4,267
Totals	79	303,108	82	325,561
THE HARTLEPOOLS.				
Wm. Gray & Co., Ltd., West Hartlepool	18	85,298 [97,100]	20	77,377
Irvine's Shipbuilding & Dry Docks Co., Ltd., West Hartlepool	15	67,791 [81,160]	10	44,923
Totals	33	153,089	30	122,300
THE TEES.				
Ropner & Sons, Ltd., Stockton	10	43,358 [50,584]	10	42,108
Richardson, Duck & Co., Ltd., South Stockton	8	36,457 [42,533]	8	33,762
Sir Raylton Dixon & Co., Ltd., Middlesbrough	8	30,806 [35,700]	8	23,467
Craig, Taylor & Co., Ltd., Stockton	6	29,530 [34,451]	6	30,817
Smith's Dock Co., Ltd., South Bank, Middlesbrough	26	12,037	30	10,029
W. Harkess & Son, Ltd., Middlesbrough	4	6,161	9	6,630
Totals	62	158,349	71	146,813
THE HUMBER.				
Earle's Shipbuilding & Engineering Co., Ltd., Hull	9	30,965 [36,125]	12	26,189
Cochrane & Sons, Ltd., Selby	39	9,986	36	8,242
Cook, Welton & Gemmell, Ltd., Beverly	34	8,459	27	7,012
Goole Shipbuilding & Repairing Co., Ltd., Goole (*see also the associated firm of the* Dundee Shipbuilding Co., Ltd., Dundee; The Tay and District)	6	2,277	27	8,110
W. H. Warren, New Holland	7	1,000	14	1,205

Henry Scarr, Ltd., Hessle, Yorks.	11	851	7	820
Joseph Scarr & Son, Beverley			8	1,145
Totals	106	53,538	131	52,723
Grand Totals of North-East Coast	376	1,029,097	402	964,894

ENGLAND: THE THAMES.

Names of Builders.	1913 No.	1913 Tons	1912 No.	1912 Tons
A. W. Robertson & Co., Canning Town, E.	30	4,990	23	4,233
Fred. Braby & Co., Deptford	8	2,000		
Edwards & Co., Ltd., Millwall, E.	24	1,598	23	1,311
Edward Hayes, Stony Stratford	5	122		
Other Firms	19	358	1	96
Totals	86	9,068	47	5,630

ENGLAND: OUTPORTS OF THE EAST, SOUTH, AND WEST COLONIES.

Crabtree & Co., Ltd., Southtown, Great Yarmouth	10	925	6	1,062
Beeching Brothers, Ltd., Great Yarmouth	7	660	8	800
Fellows & Co., Ltd., Great Yarmouth	5	428	7	548
John Chambers, Ltd., Lowestoft	27	2,155	20	1,669
Rennie Forrestt Shipbuilding, Engineering, & Dry Dock Co., Ltd., Wivenhoe, Essex	27	5,135	34	6,104
Geo. & Thos. Smith, Ltd., Rye, Sussex	3	277	2	185
J. Samuel White & Co., Ltd., East Cowes, I. W.				
John I. Thornycroft & Co., Ltd., Southampton	16	770	8	640
Camper & Nicholsons, Ltd., Gosport	5	405	4	229
Philip & Son, Ltd., Dartmouth	11	469	5	325
Simpson, Strickland & Co., Ltd., Dartmouth	29	385	31	258
Cox & Co., Ltd., Falmouth	6	399	4	225
C. H. Walker & Co., Ltd., Sudbrook, near Chepstow, Mon	11	3,280	15	2,066
Edward Finch & Co., Chepstow, Mon	16	2,450	18	1,330
Cammell, Laird & Co., Ltd., Birkenhead and Tranmere	62	37,301	40	15,132
H. & C. Grayson, Ltd., Garston	2	215		
Lytham Shipbuilding and Engineering Co., Ltd., Lytham	23	2,472	15	2,257
Vickers, Ltd., Barrow-in-Furness	1		1	25,000
R. Williamson & Son, Workington	2	1,415	4	2,824
Maryport Shipbuilding and Repairing Co., Ltd., Maryport	1	290		
Other Firms	166	7,079	100	3,160
Totals	430	66,510	322	63,814

IRELAND.

Workman, Clark & Co., Ltd., Belfast	10	83,617	9	84,441
Harland & Wolff, Ltd., Belfast (*see also* The Clyde)	3	40,644	7	77,591
North of Ireland Shipbuilding Co., Ltd., Londonderry	2	3,366		
Dublin Dockyard Co., Ltd., Dublin	3	2,668	4	1,641
Larne Shipbuilding Co., Larne	2	180	1	125
Totals	20	130,475	21	163,798

SCOTLAND.

Names of Builders	1913 No.	1913 Tons	1912 No.	1912 Tons
THE CLYDE				
Russell & Co., Port Glasgow	16	83,876	13	71,224
John Brown & Co., Ltd., Clydebank	3	58,500	2	14,450
Alex. Stephen & Sons, Ltd., Linthouse, Glasgow	5	47,715	5	29,612
Barclay, Curle & Co., Ltd., Glasgow	6	45,299	8	43,412
Scotts' Shipbuilding & Engineering Co., Ltd., Greenock	5	45,015	7	31,709
William Denny & Brothers, Dumbarton	18	36,223	17	21,545
Caird & Co., Ltd., Greenock	4	35,981	4	35,936
William Hamilton & Co., Ltd., Port Glasgow	7	35,181	7	40,029
Charles Connell & Co., Ltd., Scotstoun	6	32,720	8	45,314
Harland & Wolff, Ltd., Glasgow (*see also* Ireland)	5	30,648		
Fairfield Shipbuilding & Engineering Co., Ltd., Govan	2	30,300	3	35,326
David & William Henderson & Co., Ltd., Partick, Glasgow	5	29,446	5	27,766
Greenock & Grangemouth Dockyard Co., Ltd., Greenock (*see also* The Forth)	5	22,210	4	4,1707
Napier & Miller, Ltd., Old Kilpatrick	5	18,702	7	15,161
William Beardmore & Co., Ltd., Dalmuir	1	18,500	2	15,424
Archd. McMillan & Son, Ltd., Dumbarton	3	15,580	6	26,141
Clyde Shipbuilding & Engineering Co., Ltd., Port Glasgow	5	12,679	5	8,831
Dunlop, Bremner & Co., Ltd., Port Glasgow	5	10,500	4	7,025
Robert Duncan & Co., Ltd., Port Glasgow	2	10,251	4	15,059
Ailsa Shipbuilding Co., Ltd., Troon and Ayr	19	10,155	14	13,855
Lobnitz & Co., Ltd., Renfrew	22	7,822	16	6,883
Fleming & Ferguson, Ltd., Paisley	4	6,800	10	8,300
A. & J. Inglis, Ltd., Pointhouse, Glasgow	4	6,604	2	1,333
Wm. Simons & Co., Ltd., Renfrew	9	5,795 [6,760]	7	3,256
Campbeltown Shipbuilding Co., Campbeltown	2	4,819	4	7,574
George Brown & Co., Greenock	7	4,145	6	1,010
Ferguson Brothers (Port Glasgow), Ltd., Port Glasgow	4	3,687 [4,300]	4	2,980
Murdock & Murray, Ltd., Port Glasgow	4	3,271	7	2,521
Alley & MacLellan, Ltd., Polmadie, Glasgow	19	2,900	32	2,750
John Fullerton & Co., Paisley	5	2,763	4	2,121
Scott & Sons, Bowling	8	2,519	8	2,600
Bow, McLachlan & Co., Ltd., Paisley	7	2,490	8	1,268
Ardrossan Shipbuilding Co., Ardrossan	5	1,326	8	1,371
William Chalmers & Co., Ltd., Rutherglen, Glasgow	5	1,281	1	28
Ritchie, Graham & Milne, Whiteinch, Glasgow	10	875	4	155
P. McGregor & Sons, Kirkintilloch	5	478	7	435
Yarrow & Co., Ltd., Scotstoun, Glasgow	1	346	4	884
Hanna, Donald & Wilson, Paisley	1	265		
William Fife & Son., Fairlie, Ayrshire	7	199	11	198
D. M. Cumming & Co., Glasgow	2	120	7	325
London & Glasgow Engineering & Iron Shipbuilding Co., Ltd., Glasgow			1	4,360
Mackie & Thomson, Ltd., Irvine			15	11,320
Other Firms	74	556	62	512
Totals	335	688,542	353	587,743
THE FORTH				
Greenock & Grangemouth Dockyard Co., Ltd., Grangemouth (*see also* The Clyde)	5	10,002	6	5,846
Mackay Brothers, Alloa	2	5,062	3	5,331
Ramage & Ferguson, Ltd., Leith	3	2,387	5	5,202
Hawthorns & Co., Ltd., Leith	3	1,119	3	1,315
John Crane & Co., Leith	7	675	5	369
A. Jeffrey & Co., Alloa	2	254		
Other firms	1	20		
Totals	23	19,519	22	18,063

Shipping Federation of Canada

At the recent meeting of the Shipping Federation of Canada the following officers were elected: Andrew A. Allan, of the Allan Line, president; J. R. Binning, Furness Withy Co., treasurer; James Thorn, Dominion Line, chairman of executive council.

In his presidential address, Mr. Allan reviewed the 1913 shipping season. He pointed out that 84 more ocean steamers had come to Montreal last year than in 1912, and that 15,351,388 more bushels of grain had been shipped out of the port than during the previous year. Tramp steamers, he said, had been specially busy during the year in the Canadian trade.

"Last year I had occasion to refer to the probable lowering of the water in the river, as a result of the proposed Chicago drainage scheme. I now call your attention to a report by Arthur Surveyor, dealing with this matter," said Mr. Allan. "I might state that the federal government have appointed a commission, consisting of Dean Haskell, of Cornell University; Mr. Forneret, superintendent of the ship channel, and Mr. Stewart; chief hydrographer, to inquire into and report on the whole matter."

Bill Has Been Promised

"After repeatedly impressing upon the government the necessity of an inquiry into the pilotage conditions prevailing in Montreal and Quebec districts, I am pleased to be able to state that a royal commission was appointed early in the year, and conducted an extended and exhaustive inquiry. Owing to the report having been presented as the session was about to close, the government was unable to introduce a measure dealing with those parts of the report that required legislative treatment, but they are under promise to introduce a bill in the coming session."

Mr. Allan referred to the fine spirit of co-operation that had existed between the officials of the federation and Hon. J. D. Hazen, minister of marine and fisheries; Alexander Johnson, his deputy; Hon. Robert Rogers, minister of public works, and J. B. Hunter, his deputy; and to the valuable assistance he had received from the executive council.

In his report on the depth of water in the St. Lawrence channel, Mr. Surveyor says: "The lowest water occurred in November, 1911, when the level receded to less than 28 feet in the so-called 30-foot channel. It is evident that we are still far from the

THE TAY AND DISTRICT				
Caledon Shipbuilding & Engineering Co., Ltd., Dundee	3	13,427	8	12,133
Dundee Shipbuilding Co., Ltd., Dundee (*see also associated firm of the* Goole Shipbuilding & Repairing Co., Ltd., Goole; The Humber)	6	4,670		
Montrose Shipbuilding Co., Montrose	1	60	1	100
Totals	10	18,157	9	12,233
THE DEE AND THE NORTH				
Hall, Russell & Co., Ltd., Aberdeen	17	5,682	19	1,596
John Duthie Torry Shipbuilding Co., Aberdeen	14	3,471	17	2,609
Alexander Hall & Co., Ltd., Aberdeen	10	2,195	11	1,803
W. & G. Stephen, Banff	11	957		
Aberdeenshire Coast and Moray Firth Firms	49	2,544		
Totals	101	14,849	47	9,608
Grand Totals for Scotland	469	741,067	431	627,647

35-foot channel and, with the lowest water plane steadily receding, it will take probably more than dredging before a 35-foot channel is obtained."

Water Still Receding

Mr. Surveyor goes on to say that he is convinced that the low water plane has subsided in the last 40 years anywhere from 2½ to 3 feet, and that this fall has practically all taken place in the last 25 years. He thinks the three causes of the subsidence are the deforestation of the St. Lawrence basin, the enlarging by dredging of the controlling sections of the river, and the diversion towards the Missippi river by the Chicago main drainage canal of a large volume of water which formerly passed to the sea via the St. Lawrence river.

It is likely that one of the first actions of the new executive will be to consider this report and to urge the government to take steps to prevent further lowering of the water level in the St. Lawrence.

Internal Combustion Engines

The navy department is continuing the development of the Nuremburg type of internal combustion engines for experimental installation in the fuel ship Maumee at the navy yard, New York. The plans for the engine cost the government about $32,000, which includes a license to manufacture. Negotiations conducted by the bureau of steam engineering showed that the Nuremburg type, which promises to be satisfactory for the purposes of driving the fuel ship, was the cheapest obtainable. Another engine might have been purchased, but it would have necessitated about $100,000 for the right to manufacture. Some of the Diesel engine people wanted almost the entire available $250,000 for engine plans they would supply, according to reports. Having had some experience with the Nuremburg type, it was explained, and recognizing the advantage of having a concern in this country familiar with its construction and design, it was decided that it would be more advantageous to adopt the Nuremburg engine than any of the other types.

For the present and until large internal combustion engines reach a higher state of development, the naval engineers prefer the steam turbine for the propulsion of battleships, notwithstanding the fact that at ordinary cruising speeds the turbine is less economical than the reciprocating engine. However, the engineers are encountering considerable difficulty with some of the battleship turbines now in use, involving delays in repairs. There has been some trouble with the main turbines of one type and with the cruising turbines of another type. In several of the destroyers the blades have been stripped from the cruising turbines, but there has been no trouble with the larger or full-powered turbines of this type. For high power and for speed above 20 or 21 knots the expert naval view is in favor of the turbines.

Green Bay Harbor

By A. G. Wells

Among the great projects, of which there are very many worthy ones, for the development of our waterways, calling for millions upon millions of dollars, there seems to be danger of some of the smaller ones, which can be brought into practical use by the expenditure of much smaller amounts, possibly, but a few thousands, where far better proportionate returns can be obtained, being overlooked.

In other words, are there not many practical and entirely feasible waterways, where nature has provided nearly everything required, but still calling for a little of man's assistance, to make her gift available?

Is it not wise, in fact, good public policy, to have such cases promptly improved, even while the bigger propositions about which the writer has naught but favorable comment, are being exploited.

We believe that the current readers of THE MARINE REVIEW are more vitally interested in what promises early returns, that the present generation may receive some of the advantages, by increased business and profits, whether they are manufacturers, dealers, vessel owners, or otherwise interested.

One of these comparatively small, but highly important places, we believe to be in what is known as the Green Bay Harbor. There are few places that have shown as rapid an increase of shipments, compared with the amount of money expended by the government on harbor improvements, as at Green Bay, Wis. So far this expenditure has been used in dredging to secure an 18 ft. channel into Fox river, where it enters the waters of Green bay. This improvement has been taken advantage of quickly, but as the dock frontage within Green Bay city is quite limited and mostly improved, why is it not good business and public policy, to extend that 18 ft. channel along and up Fox river to Depere, the head of the lake level, thereby making available further room for dockage, for nearly five miles on each side of the river, or 10 miles of frontage in all, accessible the entire distance, by the great systems of railroads, the Chicago and North Western and the Chicago, Milwaukee & St. Paul, also the Green Bay & Western. In addition to these, it affords transportation by river boats, up Fox river to Lake Winnebago and the Wolf and upper Fox river beyond, affording excellent and cheap transportation facilities, through a very prosperous and populous territory.

Already there is a 16-ft. channel to Depere, and several coal docks and manufacturing plants located there, which are now only kept from making larger extensions because of the lack of another 2-ft. depth of channel, a small portion of the way only.

An estimate made some years ago, indicated that an 18-ft. channel could be opened as a continuation of the channel into Green bay, and all the way on to Depere, at a cost of not to exceed $40,000.

There is no question but such an improvement would be quickly taken advantage of by individuals and corporations increasing shipping and terminal facilities between Green Bay and Depere, and that it would be one of those cases, first referred to, where quick results would be obtained, for a very moderate expenditure.

There may be other, equally as urgent demands in the line of smaller propositions, but we know of no more available or practical harbors needing further improvements, or which will afford better returns for the money called for in order to make it one of the largest and best on the great lakes.

Ohio River Improvements

An Outline of the Work Which Has Been Accomplished During the Past Year

CHARLES A. HINSCH, president of the Business Men's Club, of Cincinnati, has received a report of the improvements to the Ohio river and its tributaries during the past year from a committee consisting of Edwin C. Gibbs, F. L. Garrison, R. P. Gilhan, O. F. Barrett and T. P. Egan. The appropriations made by the last congress for improvement of the Mississippi and its tributaries, direct and indirect, are as follows:

The status of the work on the Ohio river to date is as follows:

Dams 1-6 (inclusive).—Are located from Pittsburgh, Pa., to a point above Industry, Pa., are completed and in operation.

Dam. No. 7.—Located at Industry, Pa., is nearly completed.

Dam No. 8.—Located at East Liverpool, O., is completed and in commission.

Dams Nos. 9 and 10.—Both located above Steubenville, O. No. 9 is nearly completed and No. 10 is in process of construction, rapid progress being made.

Dams Nos. 11 and 12.—Located between Steubenville and Wheeling, W. Va. Dam No. 11 is completed and in commission, and Dam No. 12 is in process of construction.

Dam. No. 13.—Located at Bellaire, O., is completed and in commission.

Dams Nos. 14 and 15.—The former is located just below Moundsville, W. Va., and the latter at New Martinsville, W. Va. Both of these dams are in process of construction.

Dams Nos. 16 and 17.—Located between Sistersville and Marietta, O. Contract for work on both these dams has been let and rapid work thereon is assured.

Dam No. 18.—Located just below Marietta, O., is completed and in commission.

Dams Nos. 19, 20, 21 and 22.—Located between Parkersburg and Ravenswood, W. Va. Both No. 19 and No. 20 are in progress of construction and the work on the former is largely advanced. Work on Dam No. 21 has not yet been commenced, but bids have been asked for the construction of Dam No. 22.

Dams Nos. 23 and 24.—Located between Ravenswood, W. Va., and Pomeroy, O. Nothing done as yet on No. 23, but contract for the construction of No. 24, we understand, has been recently awarded.

Dam No. 25.—Located just above Point Pleasant, W. Va. No work has been done nor contract let for work on this dam.

Dam. No. 26.—Located at Chambersburg, O. The government is now repairing break on this dam which break occurred after completion.

Dam No. 27.—Located between Chambersburg, O., and Huntington, W. Va. No work done as yet nor has contract for same been let.

Dam No. 28.—Located at Huntington, W. Va. Is now under construction and rapid progress is being made.

Dam No. 29.—Located at Cattlesburg, Ky., is under construction and rapid progress is being made in the work. Was estimated to be about 46 per cent completed Oct. 1, 1913. The masonry of the lock is now practically completed and work is in progress on navigable pass and guide walls; unless some unforeseen delay occurs by reason of high water, this dam should be completed during the calendar year 1914.

Dam No. 30.—Located between Ironton and Portsmouth, O. As yet no work done there nor has contract been let.

Dam No. 31.—Located just below the mouth of the Scioto river; under contract; excavation work and masonry of lock now in progress; estimated to be completed in 1916 or 1917.

Dams Nos. 32 and 33.—Located between Vanceburg, Ky., and Maysville, Ky. No work as yet and contracts not awarded.

Dam No. 34.—Located just below Augusta, Ky. No work done as yet and contracts not awarded.

Dam No. 35.—Located near New Richmond, O. Bids for construction of this dam were opened Sept. 30, 1913, and approval of contracts now pending; estimated completion in 1918.

Dam No. 36.—Located just above the mouth of the Little Miami river. No work done and no contract let therefor.

Dam No. 37.—Located at Fernbank, O., about 12 miles below Cincinnati; was completed in 1911, and has been in operation during the seasons of 1912 and 1913.

Dam No. 38.—Located between Aurora and Rising Sun, Ind. No work done and no contract therefor has as yet been let.

Dam No. 39.—Located near Markland, Ind., above Vevay, Ind., and below Warsaw, Ky. Specifications printed; work not yet advertised; estimated completion in 1918 or 1919.

Dam No. 40.—Projected location between Madison, Ind., and Carrollton, Ky. It is now proposed to eliminate this dam by raising the crest of Dam No. 41, at Louisville, Ky.

Dam No. 41.—Located at Louisville, is completed and in operation.

Dam No. 42.—Located below New Albany, and just above the mouth of Salt river; no work done and no contract therefor as yet let.

Dams Nos. 43 and 44.—Located above Leavenworth, Ind. No work as yet on either of these dams, although we understand the government is assembling its own laborers and materials, preparatory to commencing work on Dam No. 43.

Dam No. 45.—Located just above Cloverport, Ky. No work done and no contract therefor as yet let.

Dam No. 46.—Located just above Owensboro, Ky. No work done and no contract therefor as yet let.

Dam No. 47.—Located just above the mouth of Green river. No work done and no contract therefor as yet let.

Dam No. 48.—Located just below Henderson, Ky. Is now under construction.

Dam No. 49.—Located below Mt. Vernon, Ind., and above the mouth of the Wabash river; no work has been done and no contract has as yet been let therefor.

Dam No. 50.—Located just above Caseyville, Ky. No work has been done and no contract has as yet been let therefor.

Dam No. 51.—Located below Caseyville, Ky., and above the mouth of Cumberland river; no work has been done and no contract has as yet been let therefor.

Dam No. 52.—Located above Paducah, Ky., and just above the mouth of the Tennessee river. No work has been done and no contract has as yet been let therefor.

Dam No. 53.—Located between Metropolis and Mound City, Ill. No work has been done and no contract has as yet been let therefor.

Dam No. 54.—Located at Mound City, Ill. No work has been done and no contract has as yet been let therefor.

At present no dams are proposed for elimination above Cincinnati; and no elimination of dams below Louisville as yet has been definitely agreed upon.

The committee adds:

"Our members will be interested to know that on the sixth instant, the Supreme court of Ohio finally decided that the Louisville & Nashville railroad had not the right to build elevated tracks across our public landing, and this decision finally disposes of the long litigation in that case and preserves to Cincinnati the public landing which will be so much needed for terminal facilities when the improvements of our river have been completed.

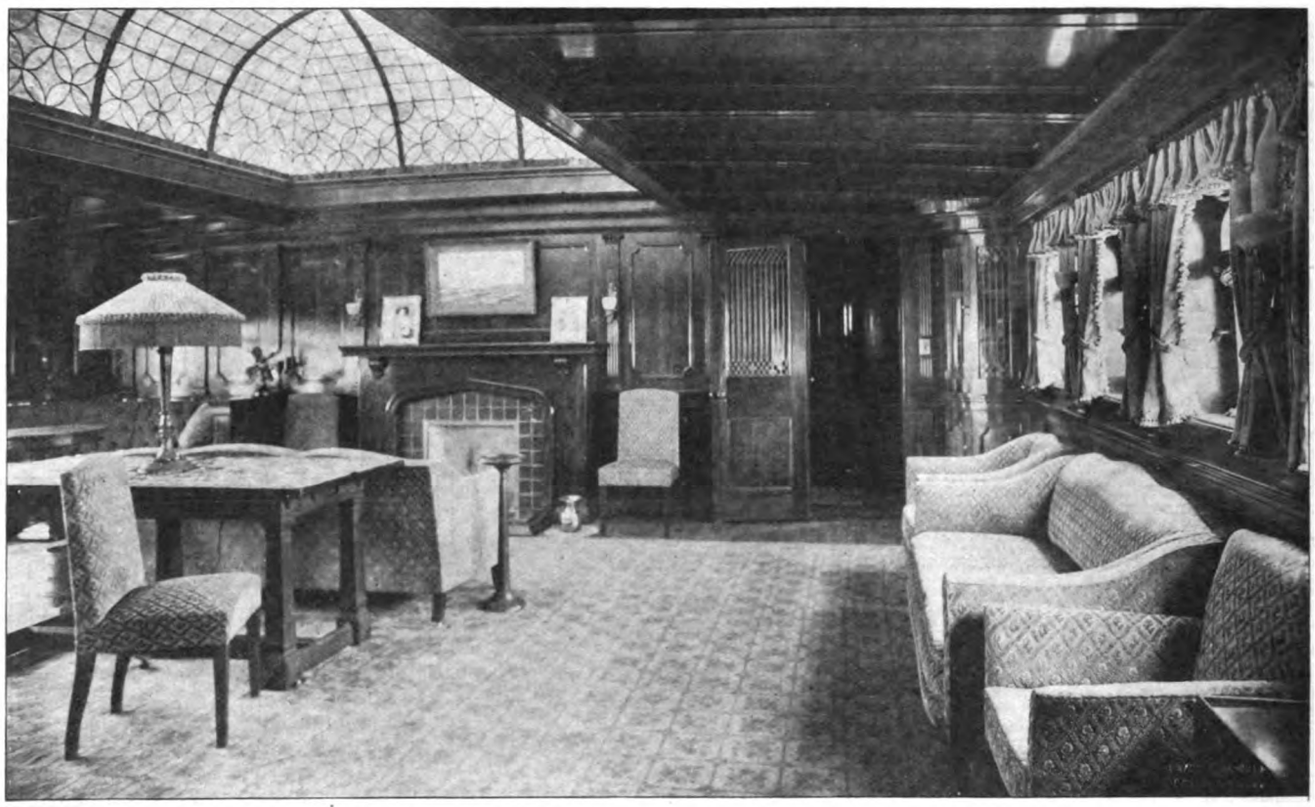
"Those who carefully read this report will be impressed by the progress made to date in the improvement of the Ohio river, and it must be borne in mind that the entire system of locks and dams, from Pittsburgh to Cairo, must be completed before the stupendous benefits therefrom will be realized by the people of the Ohio and Mississippi valleys, as well as by our entire nation.

"In the past, when the Ohio Valley Improvement Association and its sturdy, staunch supporters were knocking at the doors of congress for recognition, the admonition was—'Educate the people and congress will gladly hear and heed whatever it feels is a popular demand.' All that now, however, is a thing of the past. Both the people and congress have been educated—appropriations have been made; a large portion of the work has been either completed or commenced, and now our watch-cry is—'Let the whole work be completed at the earliest practical moment.' It is now a question of engineers' equipment and labor. If upon completion of the Panama canal, the apparatus used in the construction of that canal (or such portion of the same as could be utilized) were brought to the Ohio river, that surely would materially assist in completing the whole work at an early date.

"Our club has for many years broadly and generously supported all movements that looked toward the improvement of the Ohio river, and we trust the day is not far distant when the work will all be done and those who have labored so long and so successfully in the cause may have the gratification of seeing the benefits showered upon all the people of this valley, to be derived from so grand a work."

The Ashton Valve Co., Boston, Mass., announces that Charles W. Buckelew has been appointed manager of the New York office, No. 128 Liberty street, vice C. H. Buckelew, retired after 25 years of service.

The annual meeting of the Institution of Naval Architects will be held in the hall of the Royal Society of Arts, John street, Adelphi, London, on April 1, 2 and 3.

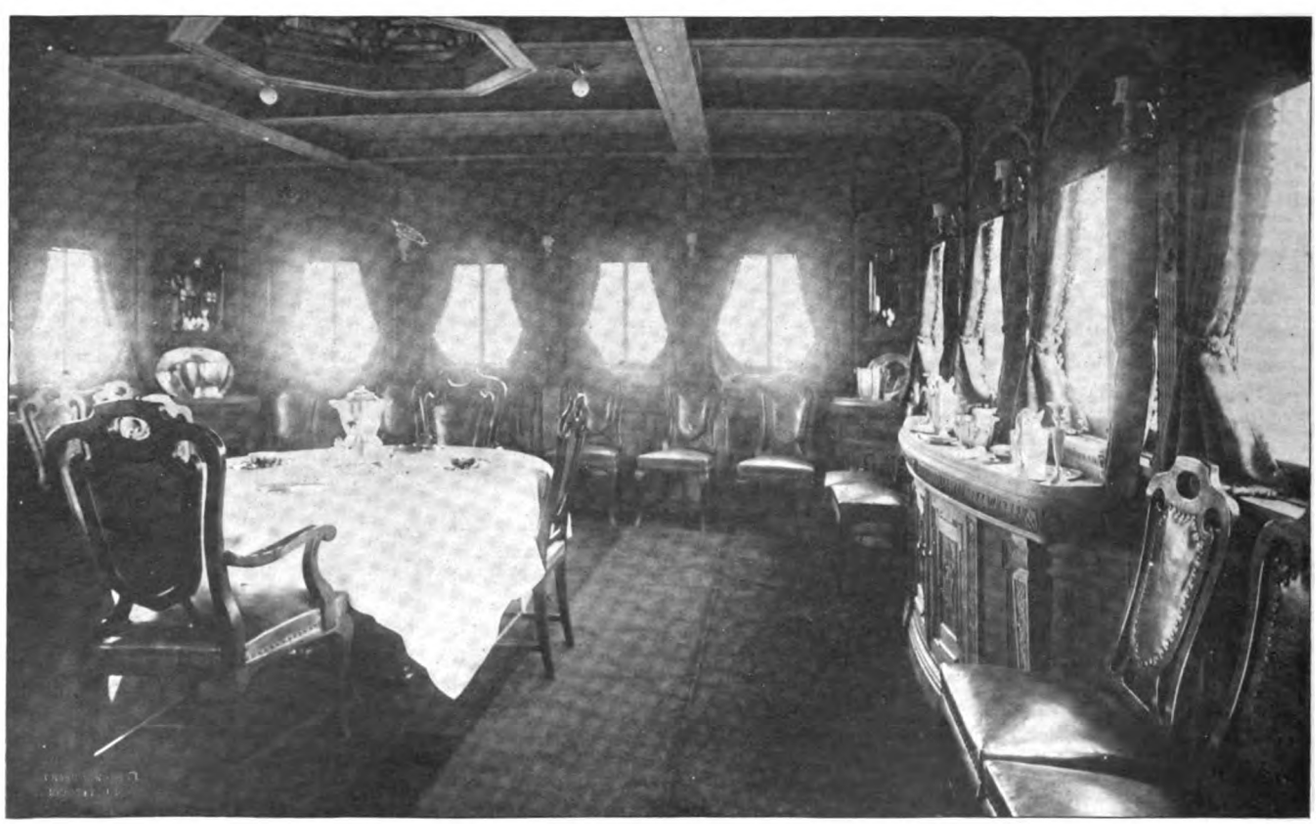


THE SPACIOUS MUSIC ROOM OF THE STEAM YACHT CYPRUS WITH ITS DOME SKYLIGHT

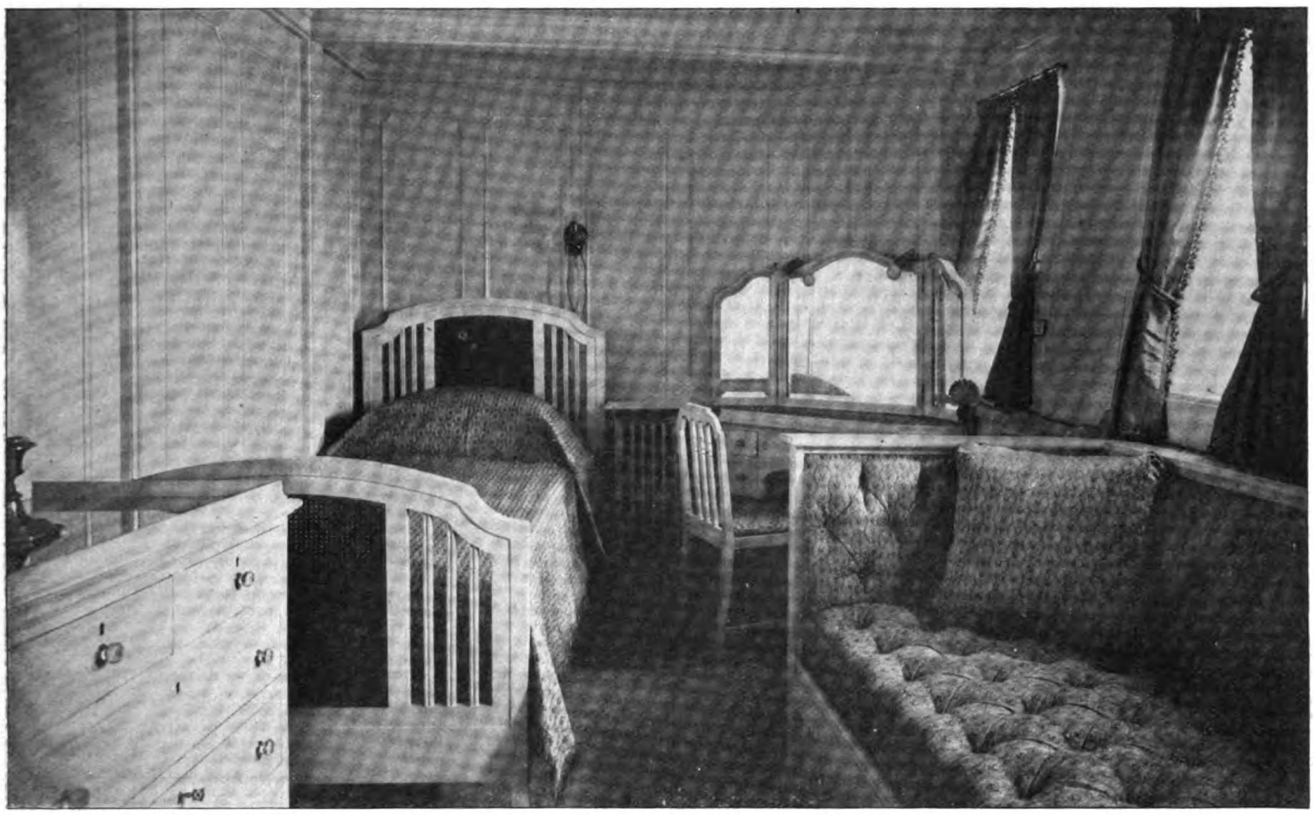
Trials of Steam Yacht Cyprus

The steam yacht Cyprus, designed by Messrs. Cox & Stevens for D. C. Jackling, of Salt Lake City, has completed her final trials and is now in use by her owner, making her headquarters in San Francisco, from which port she will make extended cruises up and down the coast. Mr. Jackling also is preparing for a trip to Honolulu with the Cyprus and expects to take a number of friends with him and be gone for several months.

Cyprus is a sea-going vessel, 230 ft. in length, of the double-deck type, with straight stem and elliptical stern

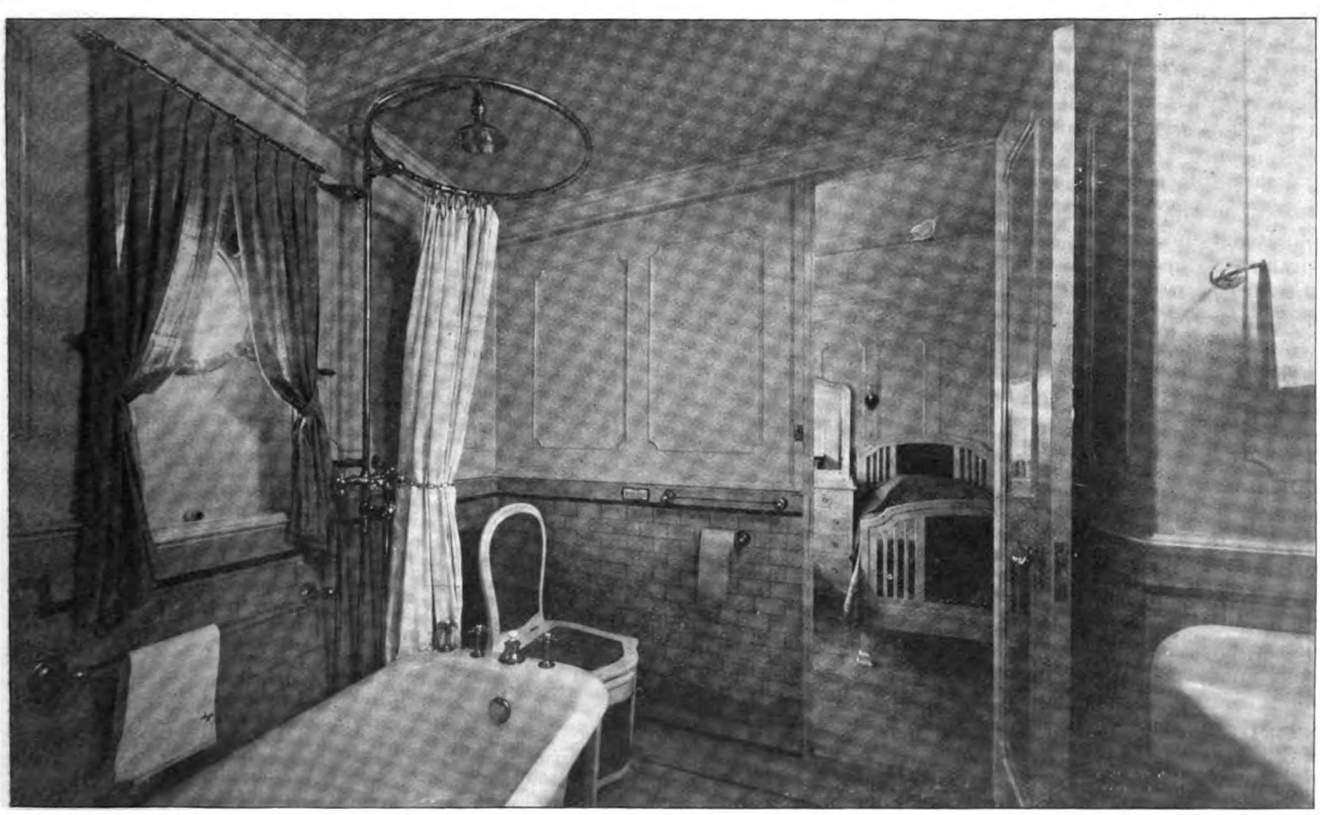


DINING ROOM STEAM YACHT CYPRUS, LOOKING FORWARD



GUEST ROOM STEAM YACHT CYPRUS. THE FINISH IS IVORY WHITE

and powerful sections, being designed for the heavy weather experienced on the Pacific. She is oil-burning and carries fuel for a trip of 6,000 knots without replenishing her bunkers. She is twin screw and has sufficient power to steam 19 knots when desired, so that she can maintain a sea speed of 13 or 14 knots very economically. Her trial demonstrated that she exceeded expectations, making 16.75 knots with natural draft, and 19.5 knots with forced draft. She was built at the Seattle Construction & Dry Dock Co.'s yard, Seattle, Wash, under the superintendence of her designers, Messrs. Cox & Stevens, and before being delivered to her owner, under-



BATH ROOM COMMUNICATING WITH GUEST SUITE, STEAM YACHT CYPRUS

went trials at sea at which time she encountered a 70-mile gale and extremely heavy weather. She proved herself an admirable seaboat and returned to the builders' yards for final storing up, after which she proceeded from Seattle to San Francisco, making the trip in the remarkably short time of two days and ten hours, notwithstanding the fact that the weather conditions were most unfavorable and a heavy gale blowing most of the time. Cyprus is a notable vessel in many ways. Her accommodations for owner and guests are unusual in extent, well laid out and the entire vessel being most superbly furnished and equipped. No expense was spared in the construction, not only of the hull and machinery but of every detail, selected hardwood being imported for the various main saloons and cabins and all the furnishings and fittings being of special design.

It is worthy of note that Cyprus is not only the largest steam yacht now on the Pacific coast, but is the only large steam yacht ever built on the Pacific, and in size she is outclassed by only four steam yachts owned by Americans and built in American ship yards.

The oil-burning feature of this vessel has proved most satisfactory, the designed speed having been obtained with great ease and the fuel consumption at ordinary cruising speeds being very moderate.

Strains in Ship's Hull

The Results of a Series of Observations on the Steamship Ancon

JAMES E. HOWARD read his paper on "Strains in Hulls of Ships, Showing the Effects of Pitching and Rolling", at the December meeting of the Society of Naval Architects and Marine Engineers, abstracting it as follows:

The paper presents the results of measurements made on the plates of the shelter deck of the S. S. Ancon, of the Panama Railroad Steamship Co., on the voyage from New York to Colon and return, also observations on the deck plates during the time the ship was taking cargo aboard at New York.

Live load strains on the deck plating while at sea were made with a new type of live load extensometer, a scissors gage, so-called, from the resemblance of its working parts to a pair of scissors. This instrument has an ultimate sensitiveness of one-hundred thousandth of an inch. The strains in the deck, observed during the time of taking aboard cargo, were measured with a strain gage of telescopic tube type with micrometer screw attachment, having a sensitiveness of one ten-thousandth of an inch.

The observations made at sea embraced those taken on the shelter deck forward and aft of the superstructure, showing the longitudinal changes on gaged lengths of 6 inches each which took place due to the pitching of the boat and vibrations which were due to the rotations of the engines. These measurements were made both on the solid plates and spanning the lap joints of those plates.

On the outward trip the ship carried a full cargo of about 10,000 tons. It was found that with this load, and during good weather with a smooth sea, that the rotations of the engines caused the development of greater strains in the deck than those which were due to a moderate pitching of the boat.

The measured strains reached a maximum in the vicinity of the after bulkhead of the superstructure, where they corresponded to a stress of 2,250 pounds per square inch, on Course B of the plating. The strains over lap joints in this vicinity were twice those observed on the solid metal of the plates. These longitudinal strains were less on plates farther aft and ceased to be measurable before reaching the stern.

On the forward part of the ship the strains in the solid plates, course C, ranged from 100 to 650 pounds per square inch, according to position, but disappearing as the bow was approached. Greater rigidity prevailed in the stringer course of plating and across the butt joints of that course, both forward and aft, than in the lap-jointed plates.

A few observations were made prior to the main series, when a moderate sea was running, which showed stresses in after part of the deck near the bulkhead ranging from 2,500 to 3,500 pounds per square inch. The greatest stress found during these observations was on the angle of the bulwark rail, immediately aft the superstructure, where a range of 5,500 pounds per square inch was observed.

While the live load strains on the outward trip were greater, due to the rotations of the engines than those caused by the pitching of the boat, the reverse was the case during the return trip from Colon to New York. Northbound, the boat carried only about 3,000 tons cargo. The pitching strains then were generally double those due to the rotations of the engines. On each trip they were greatest in the vicinity of the after bulkhead of the superstructure.

Strains due to pitching and those due to the engines were distinguished by their periodicity. The engines made 78 rotations per minute, and the strains attributed to them were developed synchronous with the rotations.

For the purpose of determining the strains in the deck plates at the time of receiving cargo, reference lengths were established, of 20 inches each, on three courses of plating and on the bulwark rail of each side of the ship. These observations extended over a period of seven days, during which time a wide range in the temperature of the deck plates was experienced. The highest temperature was 116 degrees Fahr., the lowest 60 degrees Fahr. The greatest range in stresses occurred on the stringer plates—results ranging from 4,000 to 4,800 pounds per square inch being observed. The behavior of the deck was such as to lead to the belief that variations in temperature were responsible for the largest part of the stresses rather than being due to the cargo.

Apparently, a change in stress amounting to 2,500 pounds per square inch, occurred on the rail of the boat in rising from a temperature of 60 degrees in the morning to 90 degrees at the middle of the afternoon.

These last observations were generally made in the morning, about sunrise, to secure conditions when minimum differences in temperature existed.

Mr. Howard discussed the paper at length, describing minutely the scissors gauge with which the measurements were made, and the results in

various parts of the ship caused either by cargo or the revolution of the engines. On the trip to Colon with a full cargo the cargo strains exceeded those caused by propeller revolutions but the reverse was true on the return trip with a light cargo. It is impossible to give an account of Mr. Howard's discussion, as it was illustrated by lantern slides, but these will be later incorporated in the transactions.

The Chairman:—It is hardly necessary for me to mention it, I presume you all know that Mr. Howard is one of the most distinguished men in the world in regard to the testing of materials. As you probably know, for a great many years he did all the testing with the famous machines at the Watertown Arsenal, and the enormous amount of information on which all naval architects and all other people who use materials have worked for years, has been the result of Mr. Howard's splendid work. Consequently, I feel that the society has had an unusual treat in having this splendid paper by such an eminent man in the profession, and I hope that some of you will show your appreciation of the paper by the discussion.

Loosening of Rivets

Ernest I. Cornbrooks:—This type of ship, to which Mr. Howard refers, was originally built for the Boston Steamship Co., of Boston, and as those were the first large ships built by our company, I kept in touch with them for years to see if they developed any irregularities. As confirming what Mr. Howard said in regard to the strains on the rail near the bridge, I remember that Mr. Wiley, superintendent-engineer wrote me that the only trouble they experienced was at the break of the bridge just at the point where Mr. Howard made observations. Some ten or twelve rivets would loosen. These would be redriven, and again after two or three months, they would loosen again.

C. H. Peabody:—I think that it is quite impossible to overestimate the importance of investigations of this sort, and it is also difficult to understand how so much information can be given in so short a space. This is an investigation giving us information in regard to a subject of the very highest importance, about which, so far as I am aware, we have not had direct information. The ordinary calculations for strength of ship are made habitually for ships of importance, and always should be made, but in the manner in which they are habitually made their relative applications and the results stated cannot be given at all as being absolute stresses to be expected in a ship at any time. Here we have the strains and in consequence the stresses reported to us.

Herbert C. Sadler:—I am afraid I cannot add very much to this discussion, but I should like to add my appreciation of the paper. Unfortunately, I have not had an opportunity to read it at present. One point struck me as being particularly interesting, and that was the conformation of an increase in stress due to discontinuities in the structure. Some years ago Mr. Broom, of Lloyds, read a paper upon this subject, in which he analyzed the effect of discontinuities in structure from a theoretical standpoint, and it is very interesting to see that his conclusions have been confirmed by the experiments reported in this paper. Another point in the paper, which I think is of particular interest, was the movement of the joint as compared with the movement of the solid plate. It seems rather remarkable, really, that the lap joint should move three to four times as much as the center of the plate. I think that it is a thing which we probably had not realized before, and it is, perhaps, a little hard to understand.

Elmer A. Sperry:—I do not think Mr. Howard should feel that a failure to discuss this paper is any indication of a want of appreciation of its value. I think it is one of the most remarkable papers we have had in a long time. The stresses on the deck plates are of rather a peculiar nature, and I think there is one point that might shed some light on these stresses, especially the marginal stresses as compared with the stresses at midships, as shown by the diagram.

Tests at Sea

Last year, when we were running some tests at sea, some of the naval engineers tried to determine the stresses on the beams and on the deck structure, due to our attempts to stabilize the work, and I can appreciate the wonderful work and the meaning of some of these results. There, however, seems to me to be one point that might be overlooked, and that is this—if we take a tube, we understand that a long tube is a very stable structure, with reference to torque strength. At one end there is very little spring, and as between that end and a remote end there is quite a heavy torque strain. Suppose you take a cylinder and shave it down horizontally, or saw it in two, so we have a gutter, now can any of you imagine what the torque value of that gutter is as compared with the torque value of the tube out of which the gutter was made? Calculations show that it is only 1/3600. Now, then, what is a ship? A ship is a gutter with a deck on it, and we found, by giving close observations, that a ship has a quite considerable warp, especially a ship built on the plan of a torpedo boat destroyer, long and slender, and the plate is probably at the mean thickness consistent with safety. Now, then, as you analyze these torque strains, which always come in any rough weather, you will find that the marginal portions of the deck are the portions which must receive and sustain this strain, and as the one thing which lends stability longitudinally, torquewise to the structure, as a whole, I think this should not be neglected.

Affected by Deck Temperature

Francis T. Bowles:—I suggest that Mr. Howard tell us whether this apparatus of his has been used on other structures to determine live load, and if so, where; in other words, give us some idea of the reliability of the instrument and how he came to make this test on this vessel, and whether he is at liberty to make it on other vessels.

Francis B. Smith:—I ask Mr. Howard if he noted at the time the boat took on cargo, if the draft of a vessel was affected in the march forward and aft by the different temperatures of the deck. We have reports of that kind on our ships quite frequently. We are in the lake trade. When our boats load at the head of Lake Superior and go down to the Sault Canal, where the draft is limited by the draft of water in the locks, they sometimes claim that the ship is drawing as much as two or three inches more than she would if the temperature of the sun did not have so much effect on the decks, and I would like to ask Mr. Howard if he noted that.

James E. Howard:—In regard to the features which led up to making these tests, I will say that for some time I had been engaged on the examination of engineering structures, railway bridges, buildings, pavements and strain gauge observations have been the means by which the information was acquired. In this city observations have been made on the Bankers Trust building, a limited number on the Woolworth building, on the main columns. The Missouri river bridge, at Kansas City, affords

an example of strain gauge observations on a large, modern, riveted structure. The street pavements of Cleveland and Kansas City afford additional observations, and on earlier occasions there were measurements made—these were very much earlier—on rails under different engines, and noting the effect of different wheels on the Burlington, Pennsylvania and the Boston & Albany railroads. Persons interested are very eager to acquire actual information upon the behavior of these structures, if we have the means of determining what is going on at the time of loading. A strain gauge for measuring dead loads was devised and then these small scissors gauges were the last production. The scissors gauge was gotten up, perhaps, primarily to observe the strains on steel rails under the weights of engines—locomotives—and a train of cars. I expect to make some modification of it, and to get it down to a little smaller dimensions. It is now about three inches long, and is of such size that it may be put on a piece of rail and analyses made, running through observations made at slowly moving loads.

The question of the accuracy and reliability of the instrument is, of course, one of the very first things to be considered. As far as I have been able to judge, it performs the same functions on each occasion. The instrument, as at first used, is not the easiest to be read of any, but I expect to improve on that by a few devices so that we can feel a little more certain about the finer subdivisions. I think if we get 1/5000 of an inch, we are doing pretty well, but I think we can, under some circumstances, do a little better.

The gauge was used for the first time on the deck plates of the Arcon. It is arranged, as you will see, with flexible joints. The fulcrum plates are thin flexible steel plates so that the instrument can be used where there is considerable dust, as there is no opportunity for dust to get into any of the working parts. They just consider of a flexible steel fulcrum plate. The behavior, I think, is the same on different occasions. Then it comes down to a question of calibration or rating of the scale, and that admits of being done in the laboratory with precision. On the whole, I think the instrument, or some slight modification of it, is a practicable affair.

In regard to changes of temperature affecting the draft of a boat, no observations of that kind have been made by myself. I do not know of any that have been made. The effect however, as shown on the deck of the Ancton, while receiving cargo, in which there was a change of some 5,000 pounds per sq. in., which I attribute to temperature causes, would lead one to suppose that the draft might be changed relatively, and made more or less amidships, according to the temperature of the deck. I think that theory would certainly be tenable.

The society tendered Mr. Howard a vote of thanks for his paper.

Trials of Steamer Tyler

The Performances of a Very Successful Steamer Outlined in Detail

ONE of the most interesting papers read before the December meeting of the Society of Naval Architects and Marine Engineers in New York was E. H. Riggs' paper on "Notes on the Performance of the S. S. Tyler", abstracted as follows:

This paper has been prepared with a three-fold object; first, to plead the cause of adequate trial trips; secondly, to give the members, at first-hand, definite knowledge concerning the trials of an interesting vessel; and thirdly, to follow up a paper read here last year; it gives an account of the design of the vessel, as far as her lines are concerned, and then goes on to record the trial performances, which it is hoped will be found of interest.

In view of the endeavors being made today to improve the propulsion of vessels, it is refreshing to meet and do business with owners who are sufficiently keen to have models towed and proper trials run. The average merchant ship trial trip is a farce; which simply registers the fact that the engines and screws will actually go round. When the small cost and time involved in model basin experiments for type ships are considered, also the cost and time for adequate trials, and then the resultant ultimate saving in coal bills, it is marvelous to see the way proper trials are avoided on the plea of time and cost. Exhaustive trials are only necessary on type ships, which is a different thing from every ship.

It is really not necessary to plead the cause of adequate trials before this body, because all responsible architects and engineers know perfectly well how necessary they are; if more owners could be interested and made to see the advantages of securing full data, this paper will not have been written in vain.

The loading of the ship is often a bugaboo. This vessel was loaded in the regular way and the trial results obtained at the cost of a few hours' deviation from her regular course, the observers joining her before she sailed and leaving after the trials.

Much attention has been lately drawn to the value of model basin experimentation, and perhaps I owe the society an apology for again bringing it up; the economy of operation that will result must be my excuse, and this without detracting from the great shipbuilders and engineers of the past, as we live in a progressive age.

After reading the paper Mr. Rigg said:

I should like to ask a word as to the backing and maneuvering of the Tyler; these were both tried out during the loaded trials as well as when light, and found to be perfectly satisfactory. Reference should be made here to a paper by Naval Constructor D. W. Taylor, read before this society in 1911, on the influence of form of ships upon their resistance; this paper indicated generally the result to be expected, but as the experiments were upon models somewhat finer than the Tyler, no definite prediction as to power necessary could be obtained therefrom. The time which elapsed between bottom painting and trials should be stated in this paper. The bottom was coated with McInnes anti-fouling composition, and the ship launched on the 31st of May, 1913. Between that time and the trials run on the 3rd of August she was not dry-

docked. She lay in fresh water at Camden, N. J., from the launch until July 26, during which time no appreciable fouling would take place. I also call attention to the printer's error, top of page 4, second line, for 1,500 read 1,750, which is confirmed by reference to table No. 3.

Howard C. Higgins contributed the following data confirming the ship's excellent performance:

Attention is called to the small cargoes carried on several trips and the large average space (198 cu. ft.) taken up per ton. This is due to the business being largely a one-way movement, and the ship being generally dispatched on schedule. regardless of the amount of cargo offering.

Had it been possible to obtain a full load each way, each trip, the performance as shown would have been much improved.

Charles H. Peabody:—I congratulate Mr. Rigg in presenting us with a test of a merchant ship under favorable conditions, and I wish also to express my appreciation of the statement he makes that there is no serious difficulty about preparing merchant ships for such tests. I wish he would kindly inform us what methods were used in this case for producing such a load, because it has come to my knowledge that in many cases it is exceedingly difficult to get a merchant ship properly loaded for trial, that in many cases there is no way of loading except by throwing cargo or ballast into the hold, and I believe that both of these performances, while possible, are frequently inconvenient.

C. W. Dyson (Communicated):—In reading over the article prepared by Mr. Rigg, I note that he makes no reference either to the beneficial effect of the very full midship section on the after body lines nor upon the happy choice of revolutions for the propeller.

While the complete lines of the hull govern the effective horsepower required to tow that particular hull at any given speed, the indicated horsepower necessary to be developed by the propelling engines in order that this effective horsepower may be delivered depends directly upon the form of the after body lines, upon the designed revolutions of and the permissible diameter of the propeller. In designing a propeller to deliver a given effective horsepower, and to realize the maximum tank efficiency possible, a certain diameter and a tip speed corresponding to this diameter are required. In addition, the after body of the hull must be of such form as will permit the water from forward to flow to the screw and to enter it in a solid unbroken stream. This I will designate as condition 1; it is met with in bodies having a long, fine after body and the propeller located well clear of the hull.

For condition 2, the after body lines are such as to break up the column of water flowing to the propeller, so that the propeller is working in water more or less broken up by eddies and which may also contain considerable quantities of free air. This condition produces the loss that is ordinarily called "thrust deduction", or "augment of resistance", and reduces the propulsive efficiency below the tank efficiency.

For condition 3 the diameter may be limited to a dimension smaller than that indicated by condition 1, while the revolutions remain the same. In this case the tip speed will be lower than in condition 1, the column of water acted upon by the propeller will be smaller in cross-sectional area, the velocity of flow of the water in the column will be increased, the indicated horsepower per revolution will be increased from that of condition 1, but the apparent slip per revolution will be increased over that existing for condition 1, the pitch and surface of the propeller also being increased over that of condition 1, a net loss in efficiency of propulsion resulting.

By scanning the above conditions it is seen that a propeller may operate under any one of the following conditions:

1. Under Condition 1—Maximum Efficiency.
2. Under Condition 2—Maximum Efficiency decreased by thrust deduction.
3. Under Condition 3—Maximum Efficiency decreased by diameter reduction.
4. Combined Conditions 2 and 3—Maximum Efficiency decreased by both thrust deduction and diameter reduction.

The greater number of single screw cargo steamers suffer the losses as in 4, and these losses are greatly aggravated where the midship section is fined down at the expense of the after body lines, and where the designed revolutions of the propeller are low, thus aggravating both sources of loss.

In the case of the Tyler, the effect of the full midship section was to reduce the thrust deduction to a minimum for that block coefficient, while an analysis of the propeller indicates that the reduction in diameter of propeller was practically nil, thus escaping this latter serious source of loss.

The vessel reflects great credit on both the naval architect who is responsible for the design of the hull, and the engineer who designed the propeller and machinery.

E. H. Rigg:—Mr. Chairman and Gentlemen: In regard to Prof. Peabody's question, as to how we got the ship loaded, I think the explanation is two-fold. The first part of the answer is the first two lines of the second paragraph of the abstract, which reads as follows: "In view of the endeavors being made today to improve the propulsion of vessels, it is refreshing to meet and do business with owners who are sufficiently keen to have models towed and proper trial run." That is one part of the difficulty settled—the kindness of the owners to do it, also, as well as the builders and designers.

The other part of the answer, perhaps, needs a little explanation. I:

ABSTRACT OF LOGS FOR NOVEMBER, 1913, OF S. S. TYLER

Leaving Port.	Date.	Speed, statute miles.	R. P. M.	Coal (2,000 lbs.)	Mileage.	Mean draught, ft. in.	Cargo, tons, (2,000 lbs.)	Per cent slip.
S-NY	Nov. 1	12.73	86.76	41	339	16 2	2,329	10.9
N-PP	Nov. 4	13.12	86.73	80	328	12 0	825	9.2
S-NY	Nov. 8	13.11	92.06	86	339	14 1	1,930	14.7
N-PP	Nov. 11	13.48	87.85	86	328	15 0	1,554	6.8
S-NY	Nov. 15	13.76	89.90	84	339	13 11	1,875	7.2
N-PP	Nov. 18	13.10	82.30	84	328	15 0	1,417	3.4
S-NY	Nov. 22	12.67	83.90	72	339	16 10	2,125	8.4
N-PP	Nov. 25	13.21	83.80	72	328	12 9	1,093	4.4
S-NY	Nov. 29	13.79	87.30	..	339	13 11	1,426	4.1
Averages and Totals		118.97 13.22	780.60 86.73	363 40	3,007 334	.. . 14 5	14,574 1,619	69.1 7.7

Speed, knots per hour	11.48
Coal per trip, tons, (2,240 lbs.); (including port consumption)	35.71
Knots per trip	290
Tons cargo, (2,240 lbs.) per trip	1,446
Tons knot, per trip, (including port consumption)	419,340
Pounds coal per trip, (including port consumption)	80,000
Tons cargo, one knot per one pound coal, (including port consumption)	5.24
Cubic feet cargo space per ton (2,240 lbs.) cargo carried	198
Pounds coal per knot	276
Tons cargo carried per ton of coal consumed, (including port consumption)	40.2
Average pounds per mile no deduction for port use	249.5

Displacement 14 ft. 5 in. = 3,925 tons.

is not always easy to load ships and run them, I must say. I can explain how this vessel runs from New York to Norfolk. The ship was loaded at New York and run into the Delaware capes on the regular run south, and spent a few days standardizing. Not all ships are on a route so handy to the trial course. She was kept at the cape for a few hours and afterwards ran to Norfolk.

I am glad to hear Capt. Dyson's comments on the paper, and am sorry he is not here with us. In reference to his remarks as to the full midship section and fine ends, I need do no more than refer you to the naval constructor's paper read here this morning, No. 1 on the program, and, although the paper has not been at my disposal very long, I have made a hurried reference to the curves which are contained in that paper, and find that the Tyler runs within 2 per cent of Naval Constructor Taylor's most efficient midship section. Capt. Dyson, as most of us know, has done a great deal of valuable work on screw propellers lately, and we should be very grateful for the rather free way in which he places the results of his work at our disposal.

Evolution of the Lightship

A Paper Upon Which Much Labor Was Spent — Position of the Hawse Pipes

GEORGE CROUSE COOK presented a very interesting paper entitled "Evolution of the Lightship", abstracted as follows:

The text of this monograph consists of a brief statement of the functions of the lightship as an aid to navigation, an outline of its origin and development, and a description of the first-class lightship, designated Lightvessel No. 94, of the U. S. Lighthouse Service. The illustrations consist of a sketch of the first known lightship and the plans of Lightvessel No. 94.

I desire to invite especial attention to the following paragraphs:—

In 1856, a paper "The Form of Stationary Floating Bodies" was read at the Institution of Civil Engineers, London, proposing a circular vessel for a lightship. The discussion which followed developed a wide diversity of opinion as to what form was the most desirable. * * * Scott Russell, the distinguished naval architect of his day, spoke at some length and said that he "would be inclined to give a lightship great length, with a safe but small section, and extremely fine lines."

A "Royal Commission on Lighthouses" was appointed to in-Lighthouses" was appointed to inquire into matters pertaining to the lighthouse service. In the course of its investigations it sent out a series of questions to the distinguished "scientific men" of the day, including Rankine, Faraday, Herschel, etc. One of these questions referring to the lightship called for "opinions on the best form for the hull". The replies were most varied. * * * Some advocated longer vessels, others shorter; some recommended much sheer, others, less; some favored bluff bows, others, sharp, etc.; while several advised circular hulls moored at the center of gravity. Among the advocates of the last was Professor Rankine, of the Glasgow University.

A second question "at what part of the vessel should the moorings enter"? elicited a variety of opinions; and hawse holes at a considerable height above the water, close to the water and also under the water were proposed.

I would, however, again repeat the questions raised in 1860: What is the "best form for the hull"? and "at what part of the vessel should the moorings enter"? and invite discussion thereon by the members of the society.

The Chairman:—In connection with this paper on "The Evolution of the Lightship," some of the members present must surely be from concerns which have built lightships for the government, and it would seem that they might be prepared to discuss this paper. A great deal of care and labor has been spent in the preparation of this paper, and we would like very much to have Mr. Cook's efforts receive the appreciation of a good discussion. I did not intend, by suggesting that some of the people here who had built lightships should speak on the subject to the exclusion of those who had not built them, and some of our distinguished architects, both of the navy and merchant marine, might be able to discuss the points presented in the paper, particularly the one on which Mr. Cook asks enlightenment, the best form of hull and where should the moorings enter.

E. A. Stevens Jr.:—There is just one thing I notice in the paper. Mr. Cook asks for an expression of opinion as to where the moorings should enter the hull, or, in other words, the position of the hawse pipes. All I want to say is that I happened to be looking over an old copy of the report of the Secretary of the Navy—I forget just what year it was—which had an account of the loss of the Trenton and Vandalia, by reason of the gale at Samoa. I noticed that the commanding officer (I think it was Captain, after Rear Admiral Kamberly) who was the commander of the squadron—I am not sure whether he was at that time, but at any rate, he was the commanding officer of the Trenton—who was blamed for the disaster to the Trenton. He said the disaster was partly due to the location of the hawse pipe; whether he wanted them higher or lower, I cannot recall. But I remember that question was raised, and Mr. Cook has raised it again, and I think it may be an interesting subject, not only for lightships, but other ships which are required to be anchored, or warships or certain merchant ships, before they are able to go into the dock.

The Chairman:—As a matter of historical interest, I will say that we did not imagine the position of the hawse pipes had much effect on it, although I was not on the ship at the time of the disaster. I had served on all three of the United States vessels that were there, but I left the Vandalia a month and a half before the disaster. The fact was that the Trenton and the Vandalia went aground and pounded to pieces, and it would not have made much difference where the hawse pipes were. The position of the hawse pipes may have hastened the end, but it was sure to come in the terrible seas which were raging at that time. Is there any other gentleman who desires to comment on this paper?

Arthur D. Stevens:—I will say in connection with this paper that I

have had the privilege of visiting lightship No. 4 last year, and one of the strong criticisms made was that when she would sheer in a current, and bring her cable across the bow, she would list very seriously, lay over and be a long time recovering. I simply mention that as a criticism which the men on board made.

The Chairman:—Was the hawse pipe too low or too high?

Position of Hawse Pipe

Arthur D. Stevens:—I am simply giving you the criticisms of the men on board as to the wearing action that happened to be mentioned here, on lightship No. 4. They criticized it as giving her a serious list when she sheered in the current.

Elmer A. Sperry:—I do not know that I can throw much further light on this subject, as a whole, but one phase of it interests me, naturally. You understand that within the last year the world, especially Great Britain, has been doing a great deal of research work in the rolling of ships, and the question arises whether this midship section given on page 3, as designed by the lighthouse board, is the best selection of midship section to prevent the rolling of an anchored ship. It so happens that our Naval Bureau has been pushing forward that problem further than any other navy. The English have also been making investigations in determining the relations of shapes and body form to this very self-same question of rolling. We all know that a log will not roll in the waves—there is no form line that the waves can get hold of, and based on that supposition, Naval Constructor Taylor is doing some important work. I only wish that he was here this morning to throw some further light on it. He finds there is a condition in which a log will roll when subjected to the action of the waves. In his investigation, which extends over quite a large number of models, some of the forms of which were given in this paper No. 1, he finds that there is a very large difference in the rolling of these models with a given wave force impressed, and rolled slowly, and with all sorts of periods of waves. He in fact has constructed in the end of our basin in Washington, (to which we all look for so much here in this society) a massive wave maker that has produced these waves with which he has investigated these different form lines, and it would seem to me that this, which is probably the most classical work on this subject that has yet been undertaken, and by far the most extensive and actually in water, should be consulted before the final lines are determined upon, especially for the midship section.

Gould H. Bull:—I had the honor of serving on the Trenton for one cruise and part of another, part of the cruise in which she was lost, and the hawse pipes were a source of trouble during all of her sea experience. We had to fit jackasses—jackasses are simply big plugs made of manila rope—these jackasses were fitted in the hawse pipes when we were at sea and at anchor. A pampero at Montevideo Harbor, which was probably nearly as strong as the gale at Samoa, and the surging of the chain would loosen the jackasses and they had to be fastened several times, but the water was coming in through the hawse pipes all the time. We lost a man during the anchorage at Montevideo through that cause. The fault with the Trenton was not that altogether, but with the fact that she lost her rudder early in the gale, and they could not steam out on that account, otherwise I think she would have been saved. From what I saw of hawse pipes placed low, as those were, on the gun deck, it was rather a faulty construction in that case.

Action of Tide and Waves

F. L. Du Bosque:—It would seem to me that a lightship should have no hawse pipes. It looks to me as though the two factors which would cause a lightship to deviate from her base would be the action of the tides and the action of the waves. The currents will cause a resistance on the lateral motion on the ship under the water, whereas the winds will cause a resistance in the lateral position of center of gravity above the water. The moorings should be attached to one end of the lightship, extremely to the end as far as possible, and as far away from the center of gravity of the lateral resistance as is possible. Further, it has seemed to me that the foot of a lightship would be cut away considerably; in other words, in our experience in towing vessels we find the point of attachment of the mooring line must be as far as possible from the rudder. If it were possible on a tugboat we would place the mooring line at the stem so that the water would have considerable effect in turning the tugboat. If you attach the tow line at the extreme end of the tugboat, the boat cannot do any maneuvering, cannot turn itself.

Lloyd's Scottish Staff

James French, formerly Lloyd's principal surveyor in the United States and now its principal surveyor at Glasgow, presided at a dinner of the Scottish staff of Lloyd's Register at St. Enoch Station hotel, Glasgow, on Saturday, Feb. 14. There were present leading ship-building and ship-owning interests of Great Britain, including Thomas L. Devitt, chairman of the society; Lord Inverclyde, Col. J. M. Denny, F. C. Gardiner, chairman of the Glasgow committee; J. G. Chrystal, J. A. Roxburgh, John Inglis, LL.D.; J. H. Warrack, T. W. Mc'Intyre, F. N. Henderson, Andrew Scott, secretary of the society; Charles Donaldson, F. J. Stephen, Wm. Brown, J. Dickinson, W. M. Mc'Millan, A. W. Sampson, T. P. Purdie, Wm. Law, J. W. Hamilton, H. M. Napier, Wm. Robertson, G. M. Cook, H. Lithgow, James Brown and L. Glen.

Col. J. M. Denny responded to the toast, "Lloyd's Register". He said that the temptation in building ships to make things just a little heavier than was necessary must be great, but he believed the Register would resist the tendency. He added that to give a strength of 7/32 where 3/16 would do was not only a mistake, but a crime. He did not consider that absolute safety at sea was obtainable except at a prohibitory cost. A ship would have to be so heavy as to float unloaded at her winter freeboard; she would have so many bulkheads as to produce a minimum of comfort as well as a minimum of revenue; and she would have so many life boats that there would not be room to move about her decks. He said that an attempt to reduce danger to an absolute minimum would necessarily increase danger. He did not think it possible to speak too highly of the work of Lloyd's surveyors. They had been so highly trained that shipbuilders and engineers would not have to talk down to them. His experience was that it was frequently a case of talking up to them. He thought, however, the Society should take advantage of what was done by men who were in the profession for their livelihood or its usefulness would be greatly decreased.

In replying, Thomas L. Devitt said that the work of the Society in Great Britain had nearly doubled in the past 20 years and that it had increased twentyfold abroad. He added that the work of the Society was greatly appreciated by American shipbuilders, shipowners and underwriters and took occasion to congratulate Mr. French on his promotion to the principal surveyorship at Glasgow.

Floating Cranes for Navy

The Wellman-Seaver-Morgan Co. Construct Two 150-Ton Pontoon Cranes With Busch-Sulzer Diesel Engines for the United States Navy

THE Wellman - Seaver - Morgan Co., of Cleveland, recently constructed two 150-ton floating cranes of exactly similar type, equipped with Busch-Sulzer Diesel engines for the bureau of yards and docks, United States navy, one for the Boston navy yard and the other for the Pearl Harbor naval station, Pearl Harbor, Hawaii.

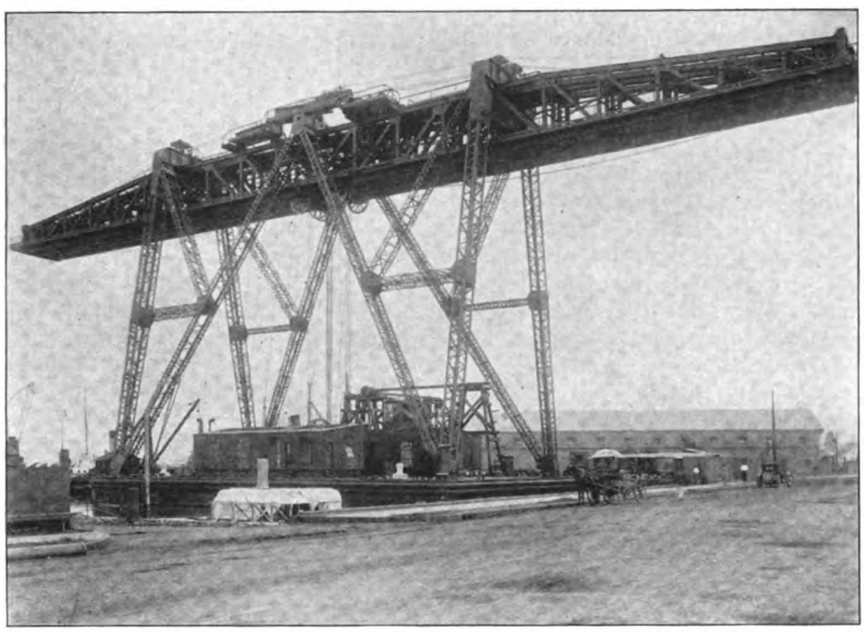


FIG. 1—THE HONOLULU CRANE

These pontoon cranes consist essentially of a bridge type superstructure, mounted on a steel pontoon, the cantilever arms of the superstructure extending beyond the ends of the pontoon a sufficient distance to give a hook travel of approximately 64 ft. beyond each end of the float.

The superstructure is rigidly connected to the pontoon and the trusses carried by the supporting legs are approximately 290 ft. overall, supported by shear legs forming a center span of 115 ft. These shear legs are substantially braced in order to take the end load due to the fore and aft list of the pontoon. The legs are of sufficient height to give a maximum hoist of the main hooks of 70 ft. above the top of the deck and sufficient hoist rope is allowed so that these hooks may be lowered 25 ft. below the deck of the pontoon.

The bridge trusses are four in number and arranged so that an auxiliary trolley, having a capacity of 15 tons, travels on rails between the two center trusses. Between the center trusses and the outside trusses a 75-ton trolley is carried on rails on each side. The extreme travel of the main trolleys is approximately 251 ft. from one end of the truss to the other. Each of the 75-ton hook blocks supported by the main trolleys is carried on a double 4-part hoisting rope 1⅝ in. diameter. These ropes are equalized at one end and are wound upon drums which are located in one of the machinery compartments in the pontoon, as will be described later. The 15-ton hook block is supported by four parts of cable which is also wound upon a drum in the machinery compartment in the pontoon.

The pontoon is of steel construction throughout, having a moulded length of 125 ft., moulded breadth of 70 ft. and a moulded depth of 14 ft. This pontoon is divided into 26 watertight compartments, being provided with collision bulkhead running fore and aft 5 ft. from each side of the pontoon, and a water-tight bulkhead fore and aft through the middle, extending the entire length. Transverse bulkheads are arranged forming two machinery compartments amidships, one on either side. These compartments are approximately 43 ft. long and 30 ft. wide. Water-tight compartments also form four full-depth counterbalance tanks approximately 15 ft. square at each end, these tanks being used to counterbalance the pontoon when lifting the maximum load at the extreme end of the cantilever arm. The machinery compartments are provided with inner bottoms 4 ft. deep.

Power for operating this crane is

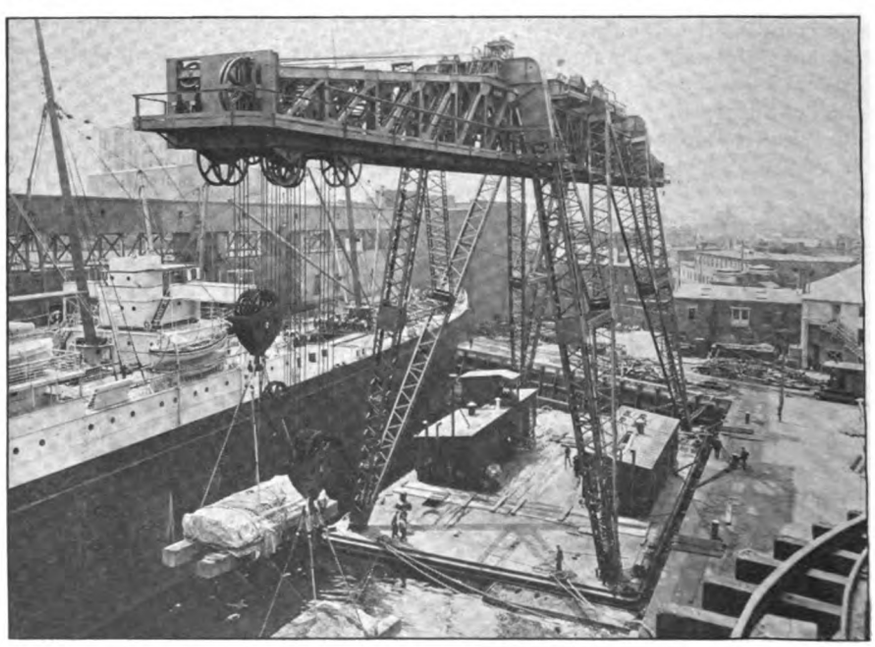


FIG. 2—BOSTON NAVY YARD CRANE HANDLING TEST LOAD OF 150 TONS

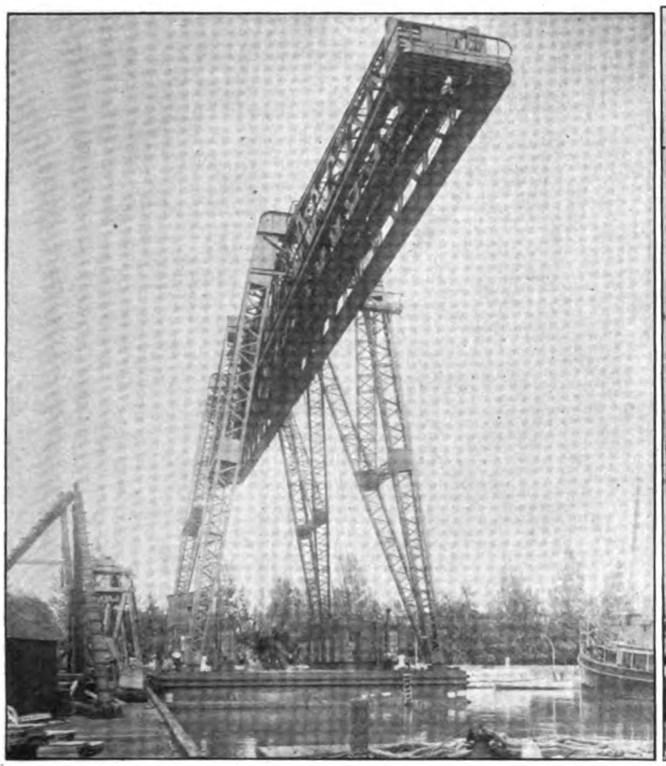


FIG. 3—THE HONOLULU CRANE

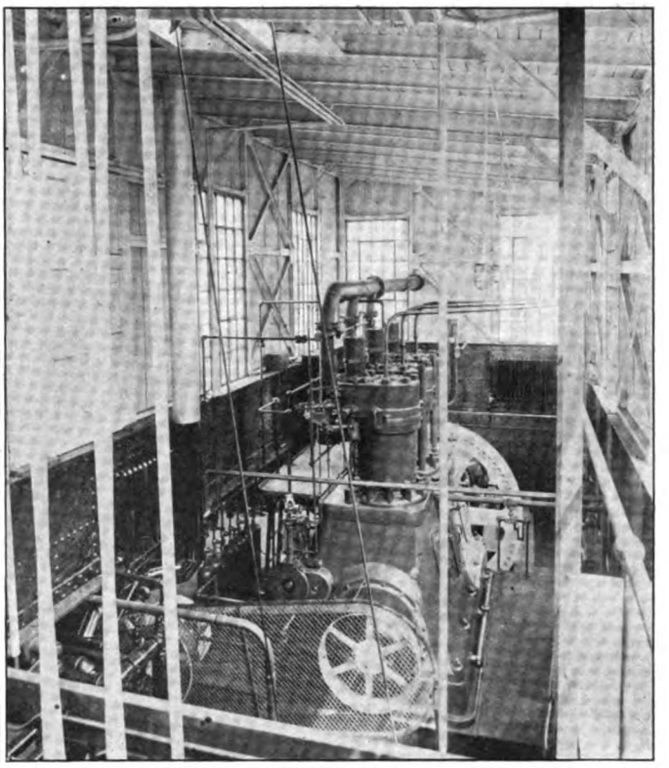


FIG. 4—DIESEL ENGINE BUSCH-SULZER TYPE

supplied by means of a triple cylinder Diesel engine, made by the Busch-Sulzer Bros. Diesel Engine Co., St. Louis, direct connected to a 100 k. w., 220-volt, direct current generator. Each of the cylinders is 18 in. in diameter and the engine has a stroke of 24 in. and is rated at 225 h. p.

In addition to this source of power there is also installed on the pontoon an Edison storage battery having a capacity of 600 k. w. hours, which may be used in case of emergency. There are two separate sets of mechanism for operating the 75-ton hooks and these mechanisms are so arranged that they may be clutched together when using the two trolleys for the maximum load of 150 tons. Each 75-ton winding drum is geared to a 60 h. p. motor, and arranged to hoist its load of 75 tons at the rate of 8 ft. per minute. Change speed gears are also introduced into this mechanism so that the empty hook can be hoisted at the rate of 100 ft. per minute. This mechanism is located in one of the machinery compartments of the pontoon and in the same compartment is also located the machinery for traversing the 75-ton trolleys. Each of the trolleys is provided with a separate winding drum which is operated by means of a 37½-h. p. motor, and the arrangement of the separate mechanisms is such that they can be clutched together when using the two trolleys at the same time for the maximum load. The gearing of the trolley mechanism is such that the trolleys under full load can be traversed across the bridge at 50 ft. per minute. In this compartment are located the magnetic control boards for the motors.

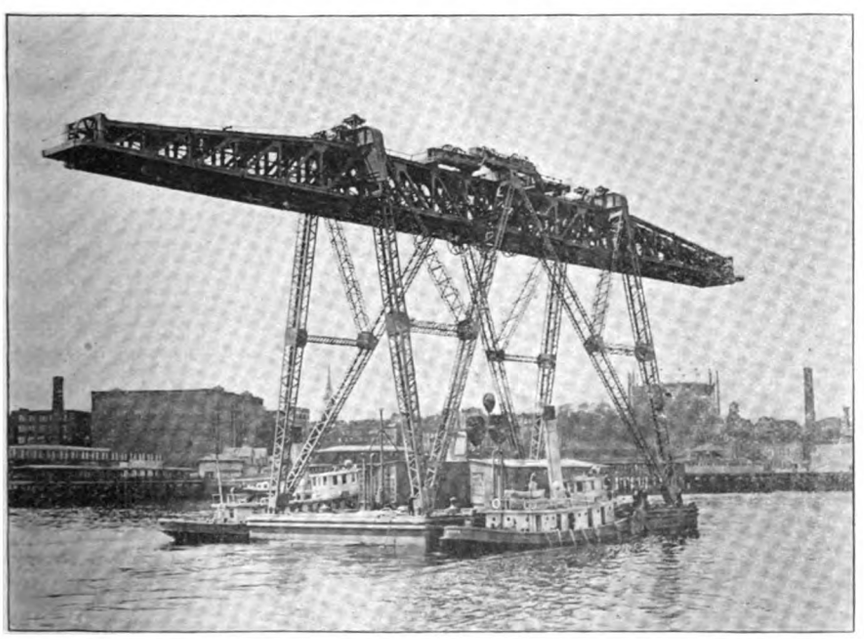


FIG. 5—VIEW OF CRANE FOR BOSTON NAVY YARD

In the other machinery compartment with the engine generator set is located the machinery for the auxiliary hoist and trolley. The auxiliary hoist drum is geared to a 60-h. p. motor of a duplicate type of those used for the main hoist. The gearing of this mechanism is such that a 15-ton load can be hoisted at the rate of 35 ft. per minute. Change speed gears are also introduced into this mechanism so that the empty hook may be hoisted at the rate of 100 ft. per minute. The auxiliary trolley travel drum is geared to a 37½-h. p. motor. The gearing of this mechanism is such that the auxiliary trolley can be traversed across the bridge at a speed of 200 ft. per minute.

The counterbalance pump is also located in this machinery compartment. This pump is of centrifugal

type, having a 10-in. suction and a 10-in. discharge and is connected to four 8-in. manifold pipes at each end for filling and emptying the water ballast compartments. This pump is driven by a 25-h. p. motor and has a capacity of 2,500 gallons per minute. The suction and discharge valves for regulating the direction of flow into or out of the counterbalance compartments, are controlled by levers in the operator's cab, which is located on top of one of the machinery houses, as shown in the accompanying photographs. The pump is also used for draining all compartments by 2½-in. bilge piping leading from a manifold to each of the watertight compartments of the pontoon.

Four electrically-driven capstans are located on the deck of the pontoon, these being separately operated by four 25-h. p. motors, operated by drum type controllers. All of the motions of the pontoon are controlled from the operator's house, located on top of one of the deck houses, as shown in the photograph. This house contains the control levers for hydraulic valves, clutches, etc., as well as the master controllers for all hoist and trolley motors and the pump motor.

Figs. 1 and 3 show the crane constructed for the Pearl Harbor Naval Station. On account of local conditions this crane was constructed at Honolulu and towed to Pearl Harbor after completion.

Fig. 4 shows the Diesel engine installed in the pontoon. Figs. 2 and 5 show duplicate machine constructed at the Boston Navy Yard. These machines are practically duplicates of each other, and have a maximum lifting capacity of 150 gross tons with the auxiliary hook, having a capacity of 15 gross tons. The purpose of these cranes is to lift guns, turrets or heavy armament to or from battleships or naval vessels, or from decks or for general dock service in connection with the navy department.

A Profitable Year

The directors of the St. Lawrence & Chicago Steam Navigation Co. have presented the following annual report to the stockholders:

"The season of 1913 has been a satisfactory one financially to vessel interests on the great lakes. We regret, however, that in common with many other companies, we suffered from the unprecedented storm of Nov. 9 in the loss of the steamship James Carruthers with many valuable lives, and we take this opportunity to extend our sincere sympathy to the bereaved families and relatives of our officers and men. We are pleased to state that the policy regarding insurance which you authorized some years ago has proved exceedingly satisfactory. We have collected $272,794.09 from the underwriters on the steamer James Carruthers, and after providing for the full balance of her cost out of our insurance fund, we still have the substantial sum of $61,096.94 at the credit of that account.

"On account of the increasing business offering, your directors have placed an order for a large modern side tank steamer for delivery next autumn, and very satisfactory progress has been made in her construction to date. To meet the cost of this vessel your directors issued $140,000 of new capital stock, offering the same to the shareholders at par.

"The directors, from the earnings of the season, have paid a dividend of 8 per cent, amounting to $68,800, and have carried forward the balance $63,504.61 to the credit of profit and loss, which added to the previous balance makes $222,150.57 at credit of that account.

ASSETS.

Four steamships — Iroquois, W. D. Matthews, G. R. Crowe, and E. B. Osler	$900,000.00	
New steamship expended to date	50,000.00	
Bills receivable	20,000.00	
Balance in Dominion Bank	315,935.57	
		$1,285,935.57

LIABILITIES.

Capital stock, old issue	$860,000.00	
Received on new issue	40,875.00	
		$900,875.00
Accounts and bills payable	101,813.06	
Balance in insurance fund after deducting loss on Str. James Carruthers less insurance recovered from underwriters	61,096.94	
Bal. of profit and loss carried for'd	222,150.57	
		$1,285,935.57

PROFIT AND LOSS ACCOUNT.

Balance forward Jan. 2, 1913	$158,645.96	
Steamship earnings	$150,161.53	
Interest	1,500.40	
		151,661.93
		$310,307.89
Cost of management	1[illegible],357.32	
Div. 8 per cent pay. Jan. 2, 1914	68,800.00	
Balance carried forward	222,150.57	
		$310,307.89

At the annual meeting by-laws were passed authorizing the directors to borrow money from the Dominion Bank should it become necessary; also respecting the issue of $140,000 of new capital stock.

The directors, who were re-elected for the current year, are:—President, W. D. Matthews; vice president and secretary, J. H. G. Hagarty; managing director, A. A. Wright; other directors, Jas. Carruthers, Capt. S. Crangle, G. R. Crowe, C. S. Gzowski and Sir Edmund Osler.

February Lake Levels

The United States Lake Survey reports the stages of the Great Lakes for the month of February, 1914, as follows:

Lakes	Feet above mean sea-level
Superior	602.18
Michigan-Huron	580.06
Erie	571.73
Ontario	245.87

Lake Superior is 0.20 ft. lower than last month, 0.61 ft. higher than a year ago, 0.36 ft. above the average stage of February of the last 10 years, 0.30 ft. below the high stage of February, 1901, and 1.42 ft. above the low stage of February, 1871. It will probably fall 0.1 ft. during March.

Lakes Michigan-Huron are 0.03 ft. lower than last month, 0.11 ft. higher than a year ago, 0.01 ft. lower than the average stage of February of the last ten years, 2.66 feet below the high stage of February, 1886, 0.90 ft. above the low stage of February, 1896. They will probably rise 0.1 ft. during March.

Lake Erie is 0.33 ft. lower than last month, 0.68 ft. lower than a year ago, 0.08 ft. above the average stage of February of the last ten years, 2.02 ft. below the high stage of February, 1863, and 1.10 ft. above the low stage of February, 1902. It will probably rise 0.1 ft. during March.

Lake Ontario is 0.27 ft. higher than last month, 0.88 ft lower than a year ago, 0.19 ft. higher than the average stage of February of the last ten years, 1.80 ft. below the high stage of February, 1886, and 2.04 ft. above the low stage of February, 1897. It will probably rise 0.2 ft. during March.

Bids have been opened at the United States Army building, Whitehall street, on the contracts for dredging the New Jersey side of the North river, from Weehawken to Edgewater under the appropriation made by congress in March, 1913. The initial expenditure of $200,000 was then authorized and another $250,000 is to follow.

There were six bids received, the firms offering for the work being Eugene Breymann, Boston; T. Sanford Ross, Inc., Jersey City; R. G. Packard Co., New York City; Morris & Cumings Dredging Co., New York City; Coastwise Dredging Co., Norfolk, Va., and William Beard Dredging Co., New York City.

Bernard Mills has succeeded George C Shepard as superintending engineer of the American-Hawaiian Steamship Co.

BRITAIN'S LARGEST STEAMER

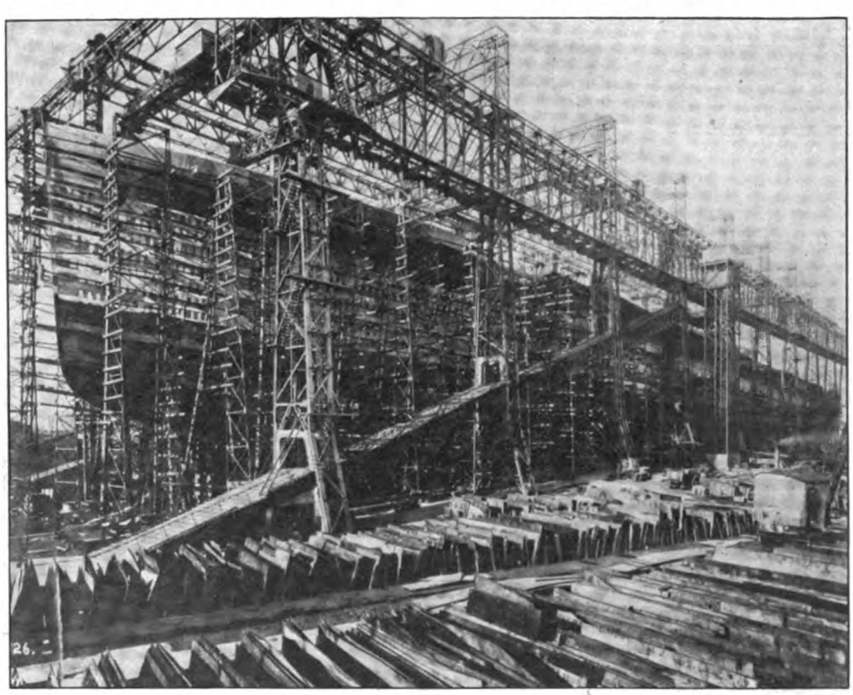
THE LATEST ADDITION TO THE GREAT WHITE STAR FLEET

THE White Star Line's newest 50,000-ton triple-screw steamer Britannic, 900 ft. long, was launched successfully at Belfast on Feb. 26, in the presence of a great throng of spectators who lined both banks of the River Lagan.

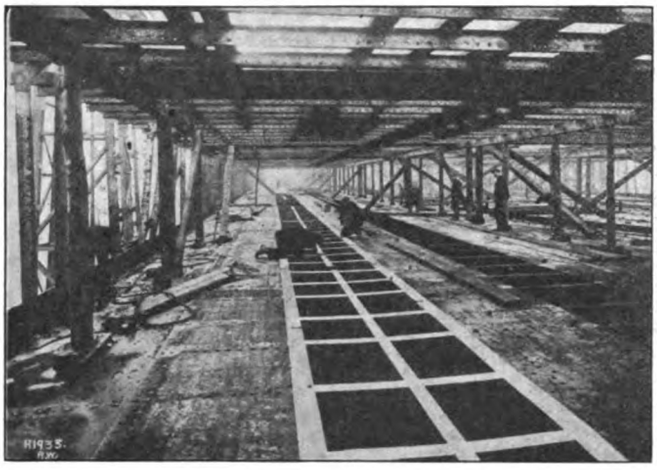
The Britannic marks a decided advance in marine construction, especially in numerous provisions for the safety of passengers and crew. This massive ship is the second White Star liner to bear this illustrious name, and is destined for the Southampton-Cherbourg-New York service of the White Star Line.

The Britannic is the largest steamer ever constructed in a British yard and represents the best ideas of ship-planning that modern builders have garnered from a rich experience during the past decade, when producing the greatest steamers in the world, each succeeding the previous one in size and wonder.

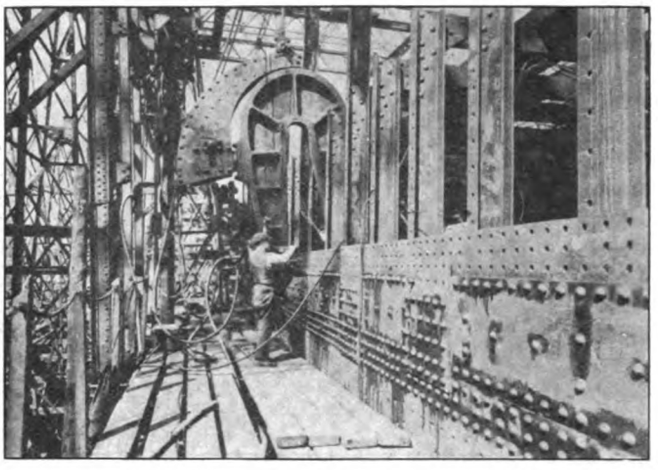
Safety, of course, has been the foremost consideration in building the Britannic. Not only does the heavily riveted double-bottom extend the entire length of the steamer, but the massive beams and close framing of the outer hull are supplemented by a heavy steel plating forming an inner hull, such as was placed first upon the Olympic. The watertight bulkheads with their electrically controlled doors are carried all the way up to the bridge deck, nearly 60 ft. above the waterline, and the utmost care has been exercised to make them especially strong, so that with these and several other precautions against serious damage, the builders have confidence that the Britannic will be able to float even though any six of her compartments should be flooded. The same non-vibrating combination of reciprocating engines with a low pres-



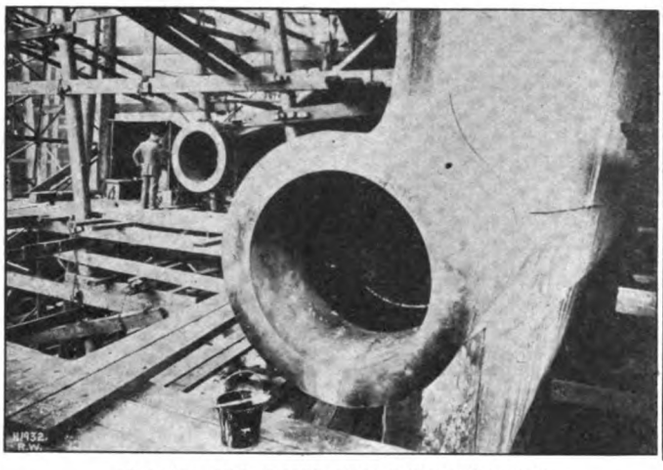
BRITANNIC ON THE STOCKS READY FOR LAUNCHING



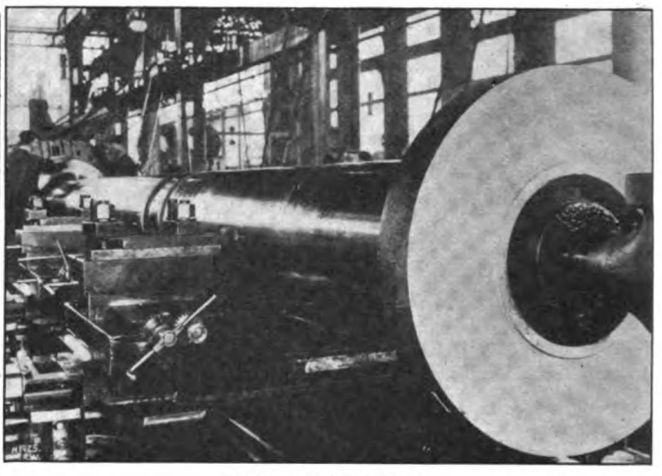
PLATING THE SALOON DECK



THE HYDRAULIC RIVETER



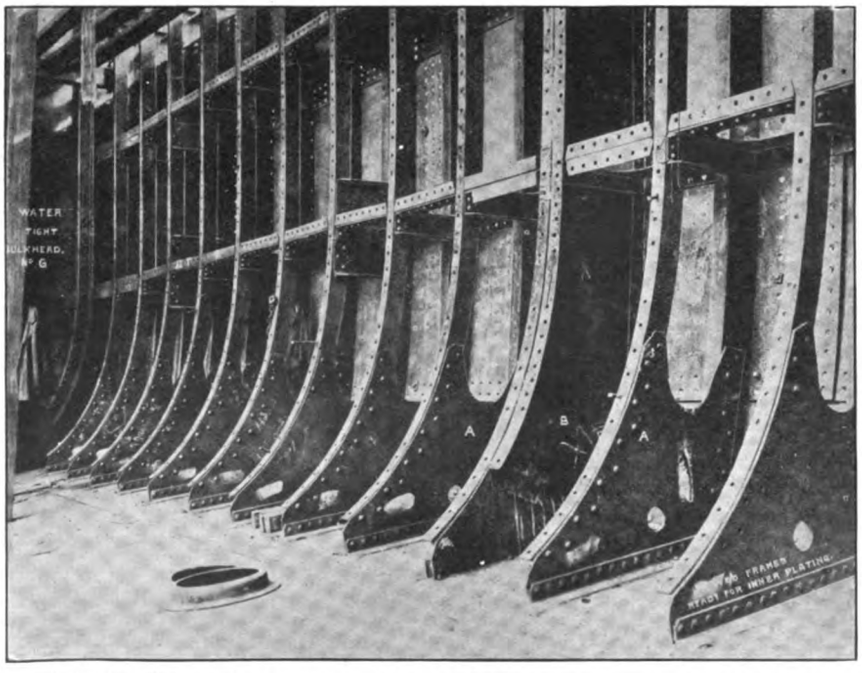
CENTER AND PORT PROPELLER BOSSES



TURBINE SHAFT

sure turbine as is installed on the Olympic will assure perfect comfort to the Britannic's passengers, and the ship's lines are so fine and the immense weight of the hull is so cleverly distributed that steadiness in any sea is practically assured.

While the first Britannic registered but one-tenth the tonnage of the new leviathan, scores of thousands will remember her great popularity, extending through three decades. During her long career this favorite old vessel steamed a total of 2,233,000 statute miles and carried 400,000 passengers in safety.



OUTER HULL AND FRAME WORK READY FOR INNER HULL PLATING

New Boat-Lowering Methods

An innovation in marine safety appliances and one that the public will appreciate greatly is the newly-patented boat-lowering gear. On the Britannic's bridge deck six pairs of huge steel derricks are provided to lower the motor-lifeboats and other life-saving equipment. Driven by independent dynamos on the bridge deck, these cranes are capable of taking a lifeboat from any part of the deck on either side of the vessel, and putting it over the side into the water with the utmost safety and precision. This staunch gear is a wonderful improvement on any other form and makes possible the lowering of every one of the ship's lifeboats, even though the steamer herself were so damaged as to be "listed" heavily, a condition which, if only ordinary lowering gear were used, would prevent the launching of more than half the lifeboats of a steamer.

In point of comfort and luxury, although the White Star Line set a new high standard when building the Olympic, the new Britannic will command even greater admiration. Everywhere the fullest advantage has been taken of the ship's enormous size. While the public apartments and the magnificent staircases are easily comparable in size to those of our foremost hotels, it is in the passenger staterooms themselves where space is most lavishly evident, and this in itself assures great comfort to the passengers. The equipment and decorations of the passenger accommodations throughout the Britannic are in the hands of prominent British and continental firms.

The Britannic will steam in the Southampton - Cherbourg - New York service of the White Star Line, in connection with the Olympic and Oceanic, but no date has been set for her maiden voyage. The Britannic will have accommodations for 2,500 passengers and 950 crew.

Shipping Combinations

The conclusion that foreign and domestic shipping of the United States is so combined by agreements, pools and conference arrangements that an attempt to dissolve the combinations would cripple trade, is reached by the house merchant marine and fisheries committee in the final report of the so-called Shipping Trust investigation, made public March 2. The committee, after two years of exhaustive inquiry, recommends that both foreign and domestic shipping combinations be placed under the strict control of the Interstate Commerce Commission, and that if necessary the commission be enlarged to care for the additional work.

The final recommendations of the committee are embodied in the fourteenth volume of its report, just compiled. It sets forth that shipping lines in practically every trade route from or to United States ports are operated by agreements to restrain competition. The reports state that the advantages accruing to both shipper and ship line through these agreements, are so great that the combinations should be allowed to continue, under the supervision of the Interstate Commerce Commission as to rates, classification, rebates and discrimination. It would be futile, the committee stated, to attempt to restore competition by ordering existing agreements terminated.

The report deals with 800 foreign and domestic navigation companies and 200 railroad lines.

In a statement summarizing the committee's findings and recommendations, Chairman Alexander said:

"Relative to the foreign trade, the report shows that it is the almost universal practice for steamship lines, both on the inbound and outbound voyage, to operate under agreements and conference arrangements which have for their purpose the control of competition between the conference lines or between them and non-conference lines. Eighty agreements and understandings, involving nearly all the regular lines operating on nearly every American foreign trade route, are in effect dealing respectively with the traffic to and from Europe, Africa, Australia, Asia, South America, Mexico, Central America and the West Indies.

"In the few instances, where several lines served the same trade and denied the existence of co-operative arrangements, it appears that one line was sufficiently powerful to dominate the other lines and, without effecting any definite agreement, to secure the desired conditions in rates. The numerous agreements referred to present fourteen distinct methods by which the lines seek to control competition, either through the fixing and regulation of rates, the apportionment of traffic, the pooling of earnings or the elimination of non-conference lines.

"With reference to the domestic trade, the facts show that competitive rates between steamship lines have been as effectively eliminated as in the foreign trade. In this trade, however, written or formal agreements are rare—apparently have been scrupulously avoided—and the elimination of competition in rates has been accomplished by other methods.

Domestic Trade Mainly Controlled

"Nearly three-fourths of the line tonnage operating in the American coastwise and great lakes trade is owned or controlled by railroads and shipping consolidations. Even as regards bulk carriers, there is a strong tendency toward the establishing of a community of interest between the owners. This is especially indicated on the great lakes, where a community of interest, through common officers, directors or large stockholders or charter relations, exists between 37 groups of bulk carriers, representing three-fourths of the American bulk tonnage on the great lakes.

"The committee concluded to recognize agreements and conferences among carriers in the foreign trade only if the same are brought under some form of effective government supervision. Open competition cannot be assured for any length of time by ordering existing agreements terminated. Such termination would either cause the lines to engage in rate wars, which would inevitably result in the survival of the fittest, or, to avoid a costly struggle, they would consolidate through common ownership.

"For this reason the committee felt that effective government supervision is the only means of eliminating existing abuses and assuring to shippers the benefits which may flow from co-operative arrangements among the lines. Such supervisory control, the committee felt, should be vested in the Interstate Commerce Commission because of the close relations between rail and water transportation. If necessary, in view of the added duties involved, the membership of the commission should be enlarged."

Recommendations

As to foreign shipping, the committee recommended:

"That all agreements and understandings between navigation companies or such companies and railroads or shippers be filed with the Interstate Commerce Commission; that the commission be authorized to determine the reasonableness of rates and to order rates changed; that rebating be prohibited by law; that the commission be empowered to enforce fair treatment of all shippers; and that the use of cuthroat 'fighting ships' and deferred rebates be prohibited."

As to the domestic trade the committee recommended:

"That in addition to the above the jurisdiction of the Interstate Commerce Commission be extended to interstate port-to-port traffic, with full powers to regulate and fix rates; that water carriers, if cutting rates against a competitor, be denied the privilege of restoring rates; that all traffic associations pertaining to rail and water or all water transportation be brought under the commission; that railroads be prohibited from making discriminatory rates or unfair divisions of rates on rail and water routes; that railroads be compelled to make terminal facilities available to all water carriers under the regulation of the commission; and that canal transportation in interstate traffic be placed under the supervision of the commission."

THE MARINE REVIEW

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March, 1914

Importing Ships Material Free

The tariff act of Oct. 3, 1913, contains the following provision in relation to the admission into the United States of material intended for use in ship construction free, the exact language being:

J. Subsection 5. That all materials of foreign production which may be necessary for the construction of naval vessels or other vessels of the United States, vessels built in the United States for foreign account and ownership, or for the purpose of being employed in the foreign or domestic trade, and all such materials necessary for the building of their machinery, and all articles necessary for their outfit and equipment, may be imported in bond under such regulations as the secretary of the treasury may prescribe; and upon proof that such materials have been used for such purpose no duties shall be paid thereon.

J. Subsection 6. That all articles of foreign production needed for the repair of naval vessels of, or other vessels owned or used by, the United States and vessels now or hereafter registered under the laws of the United States, may be withdrawn from bonded warehouses free of duty, under such regulations as the secretary of the treasury may prescribe.

This is practically the same clause that was placed as a rider into the Panama canal act and which was the subject of varied interpretations. The original ruling of the treasury department was that under its provisions even completed engines and boilers could be admitted, not alone for original installation, but for replacement as well. This was a very sweeping interpretation and was too much for the Taft administration and the president himself took a hand in it with the result that another interpretation was forthcoming which said that completed machinery or finished parts which had only to be assembled to become complete could not be admitted.

There was plenty of room for argument left, however, after the second interpretation was published so that no one knew exactly where he was at.

Now the treasury department is out with an interpretation of the tariff act which, of course, supersedes the Panama canal.

The new interpretation defines the word "materials" as including any imported merchandise which is suitable and intended for use in the construction of a hull of a vessel or of the machinery of a vessel and to be incorporated therein, either after having undergone a process of manufacture subsequent to importation or in its condition as imported. This would include raw materials to be worked up into the finished state in which they will enter into the hull or machinery of the vessel and paints, forgings, castings, nuts, screws, bolts, steel plates and other things which though complete articles are useful as parts in the construction of such hull or machinery.

Inasmuch as in Subsection 5, express provision is made for materials for the construction of (1) vessels, (2) machinery, and (3) for articles for their outfit and equipment, such terms so far as the interpretation of Subsection 5 is concerned are defined as follows:

Vessel is defined as referring to the hull and everything permanently included therein or attached thereto except the machinery as hereinafter defined.

Machinery is defined as the engines, boilers and other propelling mechanism in the vessel and includes only such mechanism as is peculiar to vessels.

Outfit and equipment is defined as including portable articles necessary or appropriate for the navigation, operation or maintenance of a vessel, but not permanently incorporated in, or permanently attached to its hull or propelling machinery, and not constituting consumable supplies. The term includes, therefore, anchors, chains, tackle, boats, repair parts, life saving apparatus, nautical instruments, signal lights, lamps, furniture, carpets, table linen, tableware, bedding, arms and munitions.

The interpretation says that in Subsection 6, relating to repairs, no distinction is made between the vessel and its machinery. The term vessel in Subsection 6 must therefore be taken as a whole with all permanent attachments necessary or useful to accomplish the object for which it is designed. All merchandise may therefore be admitted under this subsection which is suitable and intended for repair of the hull, or for the repair or replacement of permanent attachments to the vessel, including its machinery, and which are necessary or useful in the navigation, operation or maintenance of the vessel. This will include not only so-called raw materials, but in general completed articles, including machinery, either propelling or auxiliary, which are to be permanently attached to the hull of the vessel and which serve the purpose for which the vessel was designed.

The interpretation holds that the following materials and articles are excluded from Subsection 5: Completed machinery or mechanism for the propulsion of a vessel; materials intended to be manufactured into articles of outfit or equipment; articles to be used in the renewal or replacement of articles of the first or

original outfit and equipment, and propelling machinery imported in parts to be gathered and assembled together in this country will not be admitted free of duty under Subsection 5.

The interpretation is that the following materials and articles are excluded from Subsection 6: Boats, sails, lamps, furniture, carpets, table linen, tableware, bedding, arms and munitions and similar articles of outfit and equipment will not be admitted free of duty under Subsection 6.

The interpretation further holds that materials and articles excluded from both subsections are as follows: Provisions, wines, coal, medicine and other similar consumable articles; tools, scaffolding and similar miner aids or adjuncts in construction or repair; and articles or materials imported to be kept in stock, for sale for construction or repair purposes, will not be admitted free of duty under either subsection.

Shipping Combinations

The committee on merchant marine and fisheries of the house of representatives after an investigation covering a period of two years, has just made public its report on shipping combinations. It divides its report into two parts, one dealing with foreign shipping and the other with domestic shipping.

In the oversea trade it finds that a combination exists through conferences and agreements that it is practically impossible to dissolve without crippling trade. Should such existing agreements be ordered terminated, it would merely result in a rate war which would wipe out the weaker and cause the stronger elements to consolidate under common ownership. The committee feels that effective government supervision is the only means of assuring to shippers the benefits which may flow from co-operative arrangements among the lines.

In its analysis of domestic shipping it finds that the package freight business of the Great Lakes is controlled by six steamship lines, which are owned by the trunk line railroads. This, of course, is well known. Rather than haul the freight all around the whole lake system by rail, the railways have established steamship lines on the lakes to take advantage of the manifest economy of carrying the freight by water. This arrangement seems a very practical one and it is not clear how this business could be handled otherwise. The railroads, however, have had their eye on the situation for some time past and some of them have made tentative reorganizations of their steamship properties in order to comply with any decision that may be forthcoming.

The principal thing that the consumer is interested in after all is an equitable rate. He is obviously entitled to share in the economy of water transportation and undoubtedly as time goes on such economy will be reflected in the joint rail and lake rate. The Interstate Commerce Commission has already ruled that the railways must afford equal facilities to all vessels reaching their port terminals.

Referring to the bulk freight service, the committee states that the bulk freight carriers have steadily reduced rates and improved service, though it sees a tendency towards consolidation among the leading fleets and specifically mentions eight of them by name.

The interesting part of the report insofar as the lakes are concerned is that the committee recommends that port to port rates be regulated by the Interstate Commerce Commission. If adopted, this would virtually end the business of daily chartering on the lakes, because no change could be made in the tariff without 30 days' notice in advance. It is not likely that any bill incorporating the committee's recommendations will be presented to congress during the present session.

Pure Water

If England with its wretched climate is in a fair way to conquer tuberculosis, as is indicated in the latest health reports from the British government, it is nothing short of criminal carelessness if we in this country do not abolish typhois altogether. The causes of typhoid infection are well known and can be guarded against.

THE MARINE REVIEW publishes in its current issue two excellent articles on the pollution of lake water, showing very conclusively that the lakes are polluted for a considerable area and that the courses followed by the ships are likely to be polluted by the ships themselves. These articles are worthy of a great deal of study by vessel owners, because they mean much to the health of the whole country. A ship can probably be assured of a reasonably safe water supply by running off its course a bit to fill its tanks in regions of known purity, but every vessel owner should absolutely prohibit his master from filling the tanks from any of the areas in which pollution is likely to exist. There have been some very serious cases of infection during the past few years than can be directly traced to the drinking water on board vessels. The whole subject of sanitation is one that should be gone into with great care.

Running in Fog

A very learned judge in Detroit recently pronounced a most severe censure against vessel owners who permit the practice of running in fog. In this particular he appeared to put all the vessel owners into one basket, which was not a fair thing to do, because the owners of the leading fleets are very specific in their instructions to the masters upon this very point. Lake vessels are being navigated with constantly increasing caution and practices that were the rule some years ago are now the exception. The time is coming fast when an owner who will censure a responsible master for delay will be as rare as the dodo. The tendency in lake operation is to recognize individual responsibility, the responsibility of the owner as well as the master, and thus make for prudent and careful navigation. The owner who does otherwise, and there may be here and there detached cases, will find himself presently alone.

Municipal Piers at Minneapolis

The Minneapolis City council has just taken final action in the matter of providing a modern municipally-owned river terminal at the foot of Washington avenue in Minneapolis. The plans of the city engineer call for the immediate construction of a quay wall, 1,334 ft. in length, and the filling and grading of three blocks of land adjacent thereto. It was decided to go ahead with the work at once for the reason that within a few months the water at that point will be raised by the completion of the high dam 5 miles below. It is the intention to equip the terminal with the latest freight handling devices and to build a municipal spur track about 1 mile long which will connect the terminal with all the railroads entering the city of Minneapolis. This is the direct result of a very persistent campaign on the part of the Minneapolis Civic and Commerce Association, which has urged the making of Minneapolis the real head of navigation on the Mississippi river and the creation of an important shipping and transfer point at the upper end of the 6-ft. Minnesota channel which the government is fast bringing to completion on the upper Mississippi.

A navigation company has been organized which proposes to construct and operate a fleet of shallow draught barges capable of carrying 1,000 tons on 6-ft. draught.

Warren, O., is the latest aspirant for the honor of having the government armor plate plant. Well, we hold no brief in favor of any town as against Warren. Our brief is against the whole proposition. Nothing could be more comic than the government trying to make its own armor plate for the purpose of saving money.

Oil Burning for Panama Dredges

A somewhat novel installation, particularly for the eastern coast, is the boiler installation in the two Isthmian Canal Commission dredges, Gamboa and Paraiso, built by P. Delany & Co., of Newburgh, N. Y. Each dredge is equipped with two Scotch marine boilers, 10 ft. 6 in. diameter, with two furnaces and designed for 150 lbs. working pressure. The furnaces are equipped for burning both coal and oil as fuel, the burning of oil to be under the "Dahl" system.

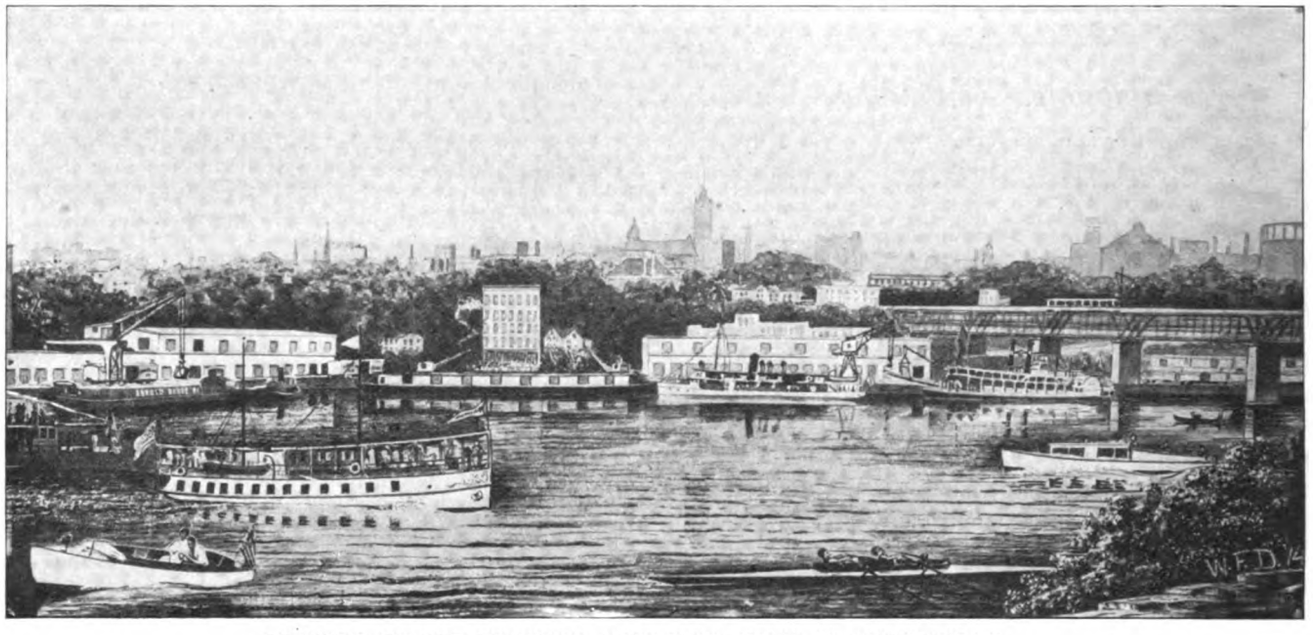
Tanks for the storage of oil are placed in the outboard side of the vessel, each tank being fitted with a steam coil to keep the liquid at a certain temperature. The oil is pumped from the tanks to the heaters when it is again heated and brought to the proper temperature for atomizing and passed through the burners under pressure. Each furnace is provided with a special oil burning front protected with asbestos and fire brick and at the rear of each furnace is installed a special arrangement of fire brick for the deflecting of the flame. The installations have proved most satisfactory under severe tests.

Wooden ship building is steadily declining in marine. From an output of 41,000 tons in 1900 it has declined to 10,000 tons in 1913.

For Vice Admirals

The bill introduced by Senator Bryan, of Florida, authorizing the president to appoint six vice admirals from the nine ranking rear admirals provides that vice admirals on sea or on shore duty in a foreign country shall receive $11,000 a year. On shore duty at home they are to have the pay of rear admirals of the ranking nine, which is fixed by length of service. The pay of a newly appointed rear admiral is $8,000 a year. By special act of congress Admiral Dewey receives $13,000 as the hero of Manila.

Our rear admirals are well paid if comparisons be made with other nations. The base of pay proper of the admiral of the fleet in England is $10,658, of an admiral $8,881, of a vice admiral $7,105, and of a rear admiral $5,329. It must be remembered that our rear admirals often do the work of officers of the highest rank in the British service. Germany gives an admiral $7,611, a vice admiral $4,297, and a rear admiral $3,342. Russia is more liberal and France less; while the Japanese scale seems absurdly low to Americans, an admiral getting $2,988, a vice admiral $1,992, and a rear admiral $1,643 a year.



DRAWING OF THE PROPOSED MUNICIPAL PIERS AT MINNEAPOLIS

The business of the marine post office at Detroit during 1913 was the heaviest on record. The post office handled altogether 807,908 pieces of mail, including 1,413 telegrams, 832 istered letters. The office sold $9,176 special delivery letters and 109 regworth of stamps and $5,000 worth of money orders and served 20,307 vessels, 11,282 of which passed in the day time and 9,025 at night.

Henry Wineman Jr.

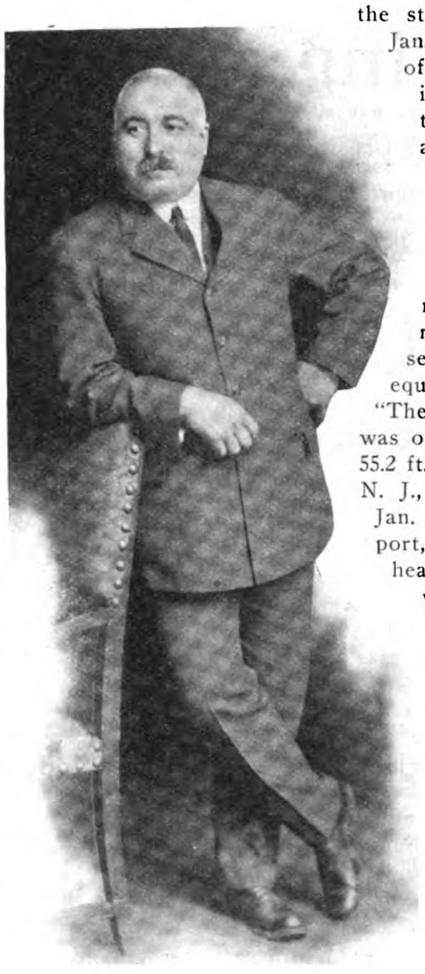
Few vessel men keep themselves better informed on general business conditions than Henry Wineman Jr., of Detroit. For a man who is not actually in the business of manufacturing pig iron and steel products, he is remarkably well informed concerning the iron trade and he makes it a point to keep his information fresh daily. He has been identified with lake trade for about 25 years, associated always with the vessel-owning end, for he has never been a sailor. He bought the steamer S. Neff about 25 years ago and followed up this venture with the purchase of the schooners J. F. Card and Lem Ellsworth. He later purchased the steamer Rawley and barge Tokio and then the steamers City of Berlin, Tampa and barge Aurora. In 1910 he built the bulk freighter Charles L. Hutchinson, which has been in successful operation ever since. Mr. Wineman has always exercised the utmost care in the selection of his officers and has left the navigation of the ship absolutely to the master with positive instructions not to venture out if weather conditions are at all calculated to jeopardize the safety of the ship and crew. For that reason he has always found it profitable to operate them without insurance, though, of course, insurance is carried on the Hutchinson, as she is a bonded vessel.

Prior to his entering the vessel business, Mr. Wineman was a lumber man and has really never ceased to be interested as a capitalist in lumber. He is now interested in large tracts of standing timber in Oregon and is one of the owners of the Pacific Alaska Steamship Co., operating out of Seattle to Alaskan ports and also to San Francisco. This company recently purchased the Admiral fleet of steamers from the United Fruit Co. Mr. Wineman expects that the opening of the Panama canal will greatly increase the value of standing timber while at the same time lowering the price of lumber to the consumer. It will be possible to bring lumber to the Atlantic seaboard at less than half the cost of the present rail haul.

He also predicts extensive development in the Alaskan coal fields, as soon as the government reaches some settled policy for their exploitation.

Mr. Wineman is interested in the Great Lakes Limestone Co., which is developing quarries north of Alpena and is now engaged in the erection of a shipping dock similar to the ore docks at the head of the lakes.

Mr. Wineman is very much in favor of allowing the railroads to advance



HENRY WINEMAN JR.

freight rates 5 per cent, believing that they are entitled to the advance, owing to the very sharp increase in operating expenses during recent years, and moreover believes that the entry of the railways into the market as a buying power will go a long ways towards restoring prosperity in this country. He estimates that 10 per cent of the wage earning class in the United States is employed by the railways or collateral industries, and to have them all actively employed seems a great deal to the general welfare of the country.

Mr. Wineman was born in Detroit and has lived there all his life. His father came from Wurtemberg, Germany, where he operated a wine and oil press and grist mill. He came to this country as a young man and established himself in business in Detroit as a caterer.

The Oklahoma Case

The supervising inspector general of the steamboat inspection service has received the report of the local inspectors who investigated the loss of the steamship Oklahoma, which occurred on Jan. 4, 1914, and which resulted in the loss of 26 lives. The inspectors state that there is nothing whatever to indicate any violation of the law, neglect of duty or overt act, whereby the loss of life and of the vessel can be attributed to any licensed officer. Neither was there any evidence to show that the steamboat inspection service was in any sense dilatory in its duty or supervision of the vessel as required by law or the general rules and regulations, for it appeared that the vessel was in good condition and properly equipped and manned. The report reads: "The Oklahoma, a bulk oil carrying steamer, was of 5,853 gross tons, length 419 ft., breadth 55.2 ft., depth 28.8 ft., and was built in Camden, N. J., in 1908. It sailed from New York on Jan. 3, in part ballast, bound for a Texas oil port, and at the time of sailing there was a heavy gale blowing from the northeast, the velocity of which was from 60 to 80 miles, though it had not been blowing long enough to raise a very heavy sea. Various other steamers which put to sea at or about the same time successfully completed their voyages. On the morning of Jan. 4, the Oklahoma, with head to the sea and engine running slowly, with little or no warning, broke almost instantaneously, at or about amidships, the two parts instantly separating. It appears that the ship, at the time of the break, was in its worst and most hazardous position, the bow and stern being buoyed up by high seas, leaving the amidship section suddenly and for a time in the hollow between the seas and deprived of the buoyancy.

"It seems that the ship did not take the second sea head on, but a little on the port bow, causing a lateral motion, which would necessarily be felt most severely amidships, where the vessel had the least hold on the water. The result was the break at this point."

The Submarine Signal Co., of Boston, has just issued a calendar to the trade containing a reproduction of the Canton packet which was built at Swansea in 1836 for the Chinese trade, of the Ocean Steamship Co.'s splendid steamer Savannah. The other illustrations are of cargo carriers, sailing ships, and scenes at sea, concluding with the Batson flying ship, which was built at Savannah in 1913, for the purpose of attempting a trans-Atlantic flight.

Bids were opened Feb. 11 by Col. E. E. Winslow, government engineer, Norfolk, Va., for the construction of two motor dredge tenders, Perry and Skycoak. The lowest bidder was the Mathews Yacht Building Co., Camden, N. J., which offered to build the two vessels for $26,975.

Coaling at Panama

The Government Has Caused a Special Report to be Made on the Subject

PROF. Emory R. Johnston has recently made a report to the United States government relative to the influence of the Panama canal on the American coal trade. It is the first attempt that the government has made to approach a situation that will shortly be of deep concern to vessel owners trading through the canal zone. Prof. Johnston says:

The cost of coal and the amount of space required for coal have a large influence upon operating expenses and upon the gross and net earnings of vessels. Other things being equal, vessel owners will select the route upon which coal is cheapest and along which coaling stations are nearest to each other. The ability to secure coal at short intervals en route enables the ship master to minimize bunker space and to use a maximum share of the ship's capacity for paying cargo. Indeed, it is often profitable for a vessel, sailing from a port at which coal is relatively cheap, to take on a comparatively small amount of coal at the beginning of the voyage, and to buy coal at higher prices at stations en route. When cargo is abundant and freight rates are remunerative, bunker space will be kept as small as practicable. Steamship managers constantly watch fuel costs, and seek so to adjust the three factors of cost of coal, quantities taken at stations, and the relation of bunker and cargo spaces as to secure maximum profits from the operation of their vessels.

Traffic of Pacific Asia

The competition of the Panama and Suez canals for the traffic of Pacific Asia, the East Indias and Australasia will be appreciably affected by the cost of coal and the number of stations along the competitive routes; indeed the relative coal prices and coal facilities via the Panama and alternative routes will have almost as much influence as will tolls upon the volume of traffic through the Panama canal. The subject was deemed to be of such importance as to require detailed discussion and has been considered carefully in the government's investigations.

The amount of coal annually consumed by ocean vessels was estimated, in 1912, by the Bureau of Statistics of Commerce and Labor, to be 75,000,000 tons, valued at over $250,000,000. Some coal companies operate depots at numerous stations in many parts of the world. In a few instances, steamship lines provide coal both for their own use and for sale, as is done by the Pacific Mail Steamship Co. at Acapulco, Mexico. The Panama Railroad Co., the capital stock of which is held by the United States government, sells bunker coal at Colon and Panama, but not in large quantities. Along the older trade routes coaling stations are frequent, while on the newer ocean highways the stations are farther apart. At the larger stations there are often several dealers, each having depots, wharves, lighters, and other loading facilities. Most steamship companies, even the larger ones, do not supply themselves with coal, but make an annual contract with some one dealer having coal at convenient stations along the routes over which the company's vessels are operated. The coal dealers publish annually the prices at which they are willing to contract to supply all coal needed by the purchasers. The contract prices are usually somewhat lower than the figure at which coal may be bought by the occasional buyer; and the annual agreements usually provide that "should the general current price for equal quality coal be lower at the time of coaling, steamers are to receive the benefit of such lower price." The contracts, moreover, are exclusive, in that coal merchants agree to furnish all the coal needed and the vessel owners bind themselves to make all their purchases from the dealers with whom they are under contract.

The cost of coal and the price at which it is sold at any particular station depend, first of all, upon the nearness or remoteness of the mines from which the coal is obtained. The stations along the Suez canal obtain coal mainly from Wales, England and Scotland, Welsh coal being most largely sold. The prices are relatively high at the Suez canal and higher south and east of the canal. The coal prices along the Suez route do not rise strictly with the increase in distance from Great Britain, but the advance is roughly in accordance with distance until stations are reached at which other coals can successfully compete with Cardiff or Durham coals. In this connection the coals from Japan, East India, Australia, China, New Zealand, are an important consideration, as on the Pacific coast of North America the coal from the state of Washington and British Columbia, and on the eastern seaboard of the United States and in the West Indies the excellent coals from Pennsylvania, West Virginia and Alabama enter into the situation. There can be no doubt that the Panama canal will permit of the American coals competing with other coals in many ports where they are yet strangers.

Rates Determine Distance

Ocean freight rates determine the distance coal can be transported to supply coaling stations. At Valparaiso, Iquique, Antofagasta and other points on the west coast of South America some distance from Coronel, the supply is chiefly American, Welsh and Australian, because of low freights on vessels bound for Chile to secure cargoes of nitrate. At Montevideo, Bahia Blanca, and other points on the east coast of South America the supply comes from Wales and England, because the outbound freights from Great Britain to that section are relatively low.

Relative prices at which different grades of coal can be sold at any particular station are determined by the steaming qualities of the coal; and the higher prices paid for the best grades sometimes enable such coal as that from Wales to be sold at stations remote from Great Britain in competition with inferior coals from nearby sources. The steaming value of different American coals is shown by the specifications under which the United States government purchases coal at different points. The specifications provide among other items, for an agreed number of British thermal units per pound of coal.

West Virginia coal, shipped from Norfolk and Newport News, is now sold at Colon, Panama, St. Lucia, St. Thomas and also in small amounts on the west coast of South America, and some other points. It is generally conceded that the steaming value coal is about 5 per cent less than that of the Welsh product, and this difference is to be taken into consideration in comparing prices and costs of this Pocahontas and New River

No other standard coals sold on a large scale at ocean coaling stations are equal in steaming value to American of Welsh coals.

The efficiency of several kinds of coal is roughly indicated by a statement by the captain of a vessel, who reports that his ship's daily coal consumption is 22 tons of No. 1 Welsh, 25 tons of Tyne, 29 to 30 of Indian or Japanese, 24 to 25 of Newcastle (Australian), 30 of Chilian, 24 to 25 New River (West Virginia), and 26 of Alabama. Another vessel was reported to have a daily consumption of 25 tons of best Welsh as compared with 26½ tons of Pocahontas, 26 Welsh run-of-mine, 28 of Lancashire or Tyne, and 30 of Indian or Japanese coal. Pocahontas coal is particularly efficient with vessels with forced draught, in which class of vessels its steam value is about equal to that of Welsh coal.

Contracts for Coal

Contracts for coal stipulate whether the coal is to be delivered f. o. b. (free on board); f. a. s. (free alongside ship); or "trimmed". Prices, likewise, depend upon whether coal is screened or run-of-mine. Coal sold as "Welsh" or "Cardiff" coal without further designation, at Port Said, for instance, has been run over one screen. Double-screened Welsh coal is termed "Admiralty Welsh", and run-of-mine, "through and through".

Relative fuel expenses of vessels using the Panama canal and alternative routes will depend, first of all, on the price at which coal is sold at the canal. Coal of high grade is to be had at Atlantic and Gulf ports of the United States and at West Indian and Caribbean stations. The Panama canal can be reached from the Atlantic ports of the United States with low fuel expense. A vessel at New York may take on coal at from $3.00 to $3.25, f. a. s., and at Newport News or Norfolk at $3.00, f. o. b., and the quantity required is small. The Panama railroad now sells Pocahontas and New River coals to merchant vessels at Colon and Panama at prices that, in most instances, yield a good profit, but it will likely not be the policy of the government if it decides to continue the sale of coal to charge prices much in excess of actual costs.

The proposed plan of leasing coal docks to coal companies will doubtless result in a competitive market that will insure low prices for coal at these docks, materially benefiting the traffic of this route. At San Francisco, the chief coaling point between Panama and Japan, the 1911 price for British Columbia coal was $6.90, but the prospect of cheaper coal with the opening of the Alaskan fields will still further popularize this highway. The use of the Panama canal by vessels engaged in traffic between Europe and the Orient will depend on the price of coal entirely, as the route via the Suez canal is the shorter and ships will have no other reason for choosing this route than the saving in fuel expense. The cost for coal will also enter into the choice of routes for voyages between Atlantic ports of the United States and Australia and New Zealand, though the time saved and the small coal consumption, with the greater capacity of the ship available for cargo will offset the fuel expense to a certain extent. From Europe to New Zealand, the Panama route is shorter and requires the consumption of less coal; but the Suez route is shorter from Europe to Australian ports. If there is a saving it will depend on lower prices for coal at Colon than are charged at Port Said to attract vessels from another route through the Panama canal.

Government contract prices for coal delivered at the end of the ship's tackle at the Isthmus have varied somewhat year by year. In 1906-7 the cost of coal at the end of the ship's tackle at the Isthmus was from $4.30 to $4.40; in 1907-8 the cost was from $4.27 to $4.42; in 1908-9, $4.14 to $4.29; in 1909-10, $3.74 to $3.84; in 1910-11, $3.94½; 1911-12, $3.80½, and since April 4, 1912, it has been $4.09½. The price now being paid by the Panama Railroad Co. is the same, having been arranged by a contract covering a period of two and a half years. The contract calls for coal at Norfolk at $2.70 and the freight is $1.39½ for delivery at the end of ship's tackle.

If to this price there be added 50 cents to cover overhead charges, storage and depreciation, and 50 cents a ton as the cost of delivering the coal aboard vessels from cars, lighters or barges, the price at which the government could sell coal without loss, or possibly with a profit at Colon, will be $5.09½. If the colliers carrying coal through the canal for delivery at the station at Balboa are required to pay a toll of $1.20 per net vessel ton, the cost of coal delivered at Balboa will be about 50 cents higher than at Colon or Christobal, so that the government could sell coal at that station at $5.59½.

Cammell, Laird & Co., Birkenhead, recently shipped to the Robins Dry Dock & Repair Co., Erie Basin, Brooklyn, N. Y., turbines intended for the Canadian Pacific Railway Co.'s steamer St. George.

The Ill Fated Oklahoma

Capt. Gunter, of the oil tanker Oklahoma, which broke in two on the Atlantic, has made the following statement concerning the accident:

"Just after breakfast, Sunday morning, I was standing just off the bridge behind the pilot house, giving our position to the wireless operator to send to the New York *Herald*. There was quite a sea running, and every now and then a spray of rain or sleet would strike us. We were practically hove to, waiting for the storm to let up, so we could proceed to the Delaware breakwater where we had orders to pick up a barge.

"Suddenly, with no warning whatever, a large wave struck both the operator and myself. When we got to our feet and the water had receded, we saw that the Oklahoma had broken in two and the stern had swung around sideways and was lying alongside of the bow. We could have jumped with ease from one half of the ship to the other. Then we drifted apart.

Stern Sank Rapidly

"The bow was then floating on an almost even keel, but the stern was sinking rapidly and the propellers were spinning wildly through the air. The wheels kept spinning until the stern sank three hours later. By this time we were some distance apart, but when it went down we could see a column of white spray fly up as the boiler burst.

"Shortly after the accident the lifeboat containing the five men who were picked up by the Gregory came past. We shouted to them, but they did not heed our call. We did not see the life boat in which Captain Cates and his 20 companions got off the stern. This boat was later picked up by the Seneca with but three men in it, two of whom were already dead. The other died without regaining consciousness. I was told by the man who sent me these photographs that the inside of the boat was practically dry, and as proof that it had not tipped, there were boxes of provisions and fishing tackle in the bottom. One of the men rescued by the Gregory tells me that they left this life boat with all hands in it to windward of the bow. At that time they were anchored to a sea anchor, with the lifeboat's head up to the wind, and Captain Cates was sitting in the stern. Whatever happened to the occupants of this boat will never be known.

"At about three o'clock the Spanish liner came up. She waited around for about an hour, and after unsuccessfully trying to launch a lifeboat

steamed away. The newspapers say I accuse the captain of the Manuel Calvo of cowardice. That is only newspaper talk. The Spanish boat may have been unmanageable for some reason or other.

"With my seven companions, I stayed on the floating bow all night not knowing at what time it would go down from under us. We couldn't leave as both the lifeboat and launch were smashed.

"At about seven o'clock Monday morning a German and an Englishman came up and in a very short time (merely a matter of minutes and seconds) the German had a boat at our side and we were sliding down a rope to safety."

Capt. Gunter says there are several things in connection with the accident for which he cannot account. In the first place he has no idea whatever why the Oklahoma buckled.

"She was the largest of her kind under the American flag and until recently, in the world. On our trip up, we were not short 1 in. of oil. There was no explosion when she broke, as has been reported, for we were running with ballast. On the contrary, there was hardly any noise whatever on account of the storm. The Oklahoma had been in much worse storms than this one. It is too bad the bow was not towed into port for examination. Another thing which was news to me was when I saw these photos is the fact that the bow turned over after we left it. However, at the time we were taken off, there was a decided list. It must have turned turtle only a short time later."

Massachusetts and Its Waterways

*By Frank Fessenden Crane.**

Massachusetts as a state has shown both ignorance and diffidence in its attitude toward the United States government, in regard to appropriations for waterway improvements. It has been a common occurrence to hear senators or congressmen condemned for their inability to make a showing of government appropriations for the rivers and harbors of the state, when the facts are, that Massachusetts as a state has not submitted projects of any magnitude, properly surveyed and approved by the United States government engineers during their tenure of office. It seems to be a well authenticated fact that our senators and congressmen have secured about all that we have asked for in the past. For the first time in the history of the state of Massachusetts, it has failed to be in the front ranks of the students of one of the greatest economic problems of the age, that of transportation.

Transportation is costing the people of the United States almost seven times their income from all sources of revenue, and Massachusetts is one of the states that transportation makes or breaks, as it hauls both ways, the raw material to the factory, and the manufactured article to the consumer; and yet, as a state, it has taken little or no interest in the development of the Connecticut, the Merrimac, and the improvement of Narragansett bay —the southern gateway to New England, whose waters extend further into the state than any other tide water, and if further extended by a canal would make it possible to deliver freights in bulk from the great lakes or the ports of the south to the port of Boston.

These three great arteries given the state by Almighty God as aids to its commerce and its prosperity, remain today almost in the same undeveloped condition of an hundred years ago. But a change is coming, the two great waterway associations of the United States—The Atlantic Deeper Waterways Association, whose project is a protected waterway along the whole Atlantic seaboard; and the National Rivers and Harbors Congress, whose slogan is, "A Policy and Not a Project"—have become recognized powers in the creating of national interest and enthusiasm in improved transportation for the whole country. They have many prominent Massachusetts men in their ranks, who are asking for government surveys of these important water routes, and when they are approved by the Board of United States Engineers at Washington, the government will be asked for an appropriation of money to do the work.

With a state that is annually contributing to the national government a revenue of $35,000,000, and which has received in all time but about $19,000,000, it would seem proper to overcome our diffidence and ask the government for the larger appropriations necessary to complete these great national avenues of trade, which mean so much to our industries and our state.

*Director, National Rivers and Harbors Congress.

The navy department has awarded contract to the Erie Forge Co. for 100 torpedo flasks at $582.46 each. The other bids were: Midvale Steel Co., $643.65; Bethlehem Steel Co., $646.71, and National Tube Co., $703.50.

Handling Boats at Sea

Editor MARINE REVIEW:—The matter of safety of life at sea has been widely discussed by some of our ablest marine architects and most practical men who have taken part in many disasters and who have had a long career at sea which qualifies them to speak on the subject with a knowledge only obtained through actual experience.

In all discussions of the subject the matter of davits and boats have received great attention. Davits as to strength, operation, installation and adaptability, boats as to capacity, shape, durability, strength, buoyancy, etc. No mention is made regarding the most essential feature, without which the ablest seaman, with the best and most modern appliances for lowering boats, is greatly handicapped and their efforts are often rendered abortive. No matter how able and experienced a sailor may be, no more should be expected of him than of a first class mechanic with poor tools to work with.

In the discussions that have taken place the essential matter of freeing boats from the tackles by which they are lowered to the water seems of such minor importance to those engaged in the controversy as to have been forgotten, or, through ignorance of the importance of this most essential feature, to have been entirely neglected.

Handling boats at sea is attended with the greatest difficulty and danger and is called for at the time of great confusion and excitement, and is only accomplished by coolness and training of those performing the work. The least they have to do to successfully get the boat away from the side, when lowered to the water, the better. Therefore, devices for detaching boats should be reliably automatic, that will only release when the boat is waterborne and not so constructed as to require some one to pull a lever, lanyard, or throw off a latch, or do something at a critical time to free the boat from the tackles by which it is lowered to the water. A device of this kind that requires some one to do a particular thing at the right time is not so reliable as one that requires no one to operate it, for the reason, boats are always crowded, the man whose duty it is to operate the detaching gear is liable to be interfered with so as to not be able to pull the lanyard, lever or throw off the latch at the right time, thus making a disastrous launch of the boat; also devices for this purpose that can be pulled off or

detached before the boat is waterborne, are liable to be detached inopportunely or at an improper distance from the water, thus landing the boat heavy end or side down. It is impossible at time of excitement to trim a boat when loading so that she will land on an even keel when dropped from a distance to the water. Instances are too numerous to mention, where boats have been detached in this way by some one tripping over the lanyard while getting into the boat, or throwing the lever or latch at an improper time.

Another most essential factor to be taken into consideration is the hooking on of the boat. This is most important, as boats are often used for other purposes than abandoning ship, such as making rescues, whereby delay, caused by not being able to hook on quickly, they are often smashed alongside, to say nothing of the danger to the men in the boat.

The accounts of recent disasters will confirm many of the statements herein. In the loss of the Titanic, as described by Mr. Lawrence Beasly, a Cambridge University man, who was a passenger, a vivid picture is given of lowering and freeing boat No. 13, in which he left the ship's side. The boat was lowered with 60 or 70 people on board, and to quote from Mr. Beasly, after reaching the water, with boat No. 14 coming down so close to the occupants of boat No. 13 that they could reach up and touch the bottom of boat No. 14 above them.

"We had no officer aboard nor petty officer or member of the crew to take charge. So the stoker shouted: 'Some one find the pin which releases the boat from the ropes and pull it up.' No one knew where it was. We felt as well as we could on the floor and sides, but found nothing, and it was hard to move among so many people. We had 60 or 70 on board." Boat No. 14 was still being lowered when he says, "The next drop would have brought her on our heads, but just before she dropped another stoker sprang to the ropes with his knife. One, I heard him say, two, as his knife cut through the pulley rope, and the next moment we were carried clear while boat No. 14 dropped into the water." Imagine what would have been the fate of those in the boat with Mr. Beasly had there been a sea on and the stoker with no knife. Had this boat been fitted with automatic releasing device properly constructed she would have gone clear of her tackles when she reached the water.

More recent accounts in the daily papers of an attempt to rescue the people from the oil steamer Oklahoma, one of the rescuing steamers failed to get two boats away, for the reason, in one of the boats some one neglected to throw back the tiny lever spilling the men in the boat into the water, and in the other boat, one man had his fingers cut off in attempting to operate the detaching gear.

Many instances of this kind have appeared in the press from year to year, and can be related by "men who go down to the sea in ships". Therefore, men who perform such perilous work should be provided with the best appliances for the purpose and the selection of them should be considered the major rather than the minor part of the equipment of a boat. There are times when it would be impossible to safely launch a boat with the best automatic devices, but how much more difficult would it be at that time to perform the same work with devices that are complicated in construction and require some one to operate them at a critical time when all is confusion and excitement.

James Richardson.

New York, Feb. 26.

Pearl Harbor Dry Dock

The navy department has completely reversed its policy in the construction of the dry dock at Pearl Harbor, Hawaii, through the appointment of a special board of engineers to submit estimates for completion of the work under the plans of Civil Engineer Alfred Noble, New York. From these estimates the department will decide whether to proceed with the work under contract or handle the dry dock construction itself. The members of the board are Civil Engineers L. M. Cox and F. R. Harris, the former stationed at the Norfolk navy yard, and the other at the New York yard. They have been instructed to take up the work at once and complete it with the utmost dispatch, in order that construction along the new lines may be begun at the earliest possible date.

Work on the Pearl Harbor dock had proceeded satisfactorily under the government's contract with the San Francisco Bridge Co. until Jan. 17, when the entire concrete floor of the structure was lifted by a tremendous subsurface pressure. At that time the contractors complained to the navy department that the plans for the dock were not suited to the conditions as they had developed. At their request an expert on the foundation conditions was sent to Hawaii, Engineer Noble being selected. His report was to the effect that the plans should be changed to meet with conditions that had developed.

Two weeks ago the contractors were ordered to proceed with the work on the first plans, but Saturday this order was revoked by the new decision. The total contract for the dock, to be 1,000 feet long, involves approximately $3,200,000, a large part of which had been expended when the floor became raised a year ago.

Sale of Naval Vessels

Several obsolete naval vessels are about to be advertised for sale by the navy department. Among them is the Manila, an iron, schooner-rigged vessel, of 1,750 tons displacement, built at Leith, Scotland, in 1881, captured from the Spaniards at Manila, and now at the navy yard, Mare Island, Calif. The vessel is appraised at $10,000 and will be sold on May 4.

Another vessel to be sold is the Restless, a converted iron yacht of 158 tons displacement, built in 1887, and now at Newport, R. I., the appraised value being $2,000.

It had been intended to sell the second class cruiser Newark, which has been the station ship at Guantanamo, Cuba, and now is at the navy yard, Norfolk, having an appraised value of $50,000, but the vessel has been withdrawn, and will be turned over to the public health service. Some consideration has been given to the sale of the Independence, which has been used as a receiving ship at Mare Island, Calif., but citizens of Vallejo, Calif., have expressed a desire to have the ship turned over to them for preservation as a relic. This is a wooden vessel, built at Boston, in 1837, and having a displacement of 3,270 tons.

The Pusey & Jones Co., Wilmington, Del., has been awarded a contract to build a 192-ft. steel steam yacht for E. L. Ford, of Detroit, Mich., and Robert Jacob, of City Island, has received a contract for a similar craft 188 ft. long from Edward Ford, of Toledo, O. Both vessels were designed by William Gardner & Co., of New York, and will have engines built by the Gas Engine & Power Co., and Charles L. Seabury & Co., Cons., of Morris Heights, N. Y. The latter will also furnish the boilers for E. L. Ford's yacht, and the Almy Water Tube Boiler Co., of Providence, R. I., will supply the boilers for the Edward Ford yacht.

Refrigeration Without Ice

In view of the increasing difficulty of securing sanitary water supplies and the doubly serious problem of sanitary ice, the appearance on the American market of a little refrigerating machilne, suitable for the family refrigerator, is of the greatest importance. This machine is of French origin, and has been in operation in that country for something like seven years. It is arranged so that it can be applied to any refrigerator (and in the larger sizes to a series of refrigerators) and produces temperatures lower than can be secured with ice, giving a dry cold and the better sanitary conditions that go therewith. At the same time the machine makes such actual ice as is required for table use and for drinks, and holds ready for instant use enough ice to take care of special requirements, such as making ice cream, etc.

Complications of Machinery

The difficulties which have up to the present time stood in the way of sanitary household refrigeration have been the complication involved in all the refrigerating machines available, and the danger involved in their complication. Most of these machines have used either ammonia or carbonic acid, both of which are subject to considerable danger of explosion from improper handling of the machine. It is a well known fact that any serious exposure to ammonia fumes is very apt to be followed by an attack of pneumonia.

The cost of operation of former machines has also been a serious handicap.

The appearance on the American market of the French machine above referred to, namely, the Audiffren-Singrun refrigerating machine—makes an advance in the art of refrigeration along very original lines.

It is the invention of the Abbe Marcel Audiffren, a professor of physics at the former Catholic college at Epinal, France. The machine is so simple that as it is arranged for use in this country it is started or stopped by a single motion. There are but two bearings to be oiled. The machine makes less noise than does the motor which drives it. There is no possibility of any explosion due to the action of the machine. As the manufacturers put it: "If the operator turns on the water and power the machine turns on the cold."

In appearance the Audiffren-Singrun refrigerating machine is practically a large dumbbell with a pulley on the end. It consists of a shaft having a hollow drum on one end, another drum at the middle and a pulley at the other end. The machine is carried in two bearings, the first being placed horizontally and the bearings being on each side of the drum at the middle of the shaft. When the machine is revolving in these bearings the end drum becomes cool and the drum at the middle becomes warm. Water is kept supplied to the middle drum to keep it from becoming too warm, and the cooling effect of the end drum is used to cool brine (common salt and water), which brine is then circulated through cooling coils which may be placed wherever it is convenient.

The machine operates by causing a liquid to evaporate in the drum at the end of the shaft, drawing the gas resulting from this evaporation in the middle drum through a passage in the shaft. In this middle drum the gas is compressed and returned to the liquid state after giving out its heat, and is then allowed to pass back to the end drum through a second passage in the shaft to be re-evaporated and repeat its cycle of operation.

The working parts of the machine are hermetically sealed within the drums and are lubricated by a bath of oil, which, together with the refrigerant, is charged into the machine in the factory and remains permanently.

This feature of hermetically sealing and the permanence of both the lubricant and the refrigerant is the most striking thing about this machine. There is no breaking down of the refrigerant and none can escape, so that this part of the apparatus is permanent. The oil is protected from oxidation and also from dirt, thus avoiding the two sources of deterioration of oil. Upon this fact, and upon the skillful design of the parts so that they are constantly subject to the most thorough lubrication, the life and success of the machine depend.

Laws of Thermodynamics

Those who are familiar with the laws of thermodynamics will realize at a glance that the machine automatically operates under the very best possible conditions as regards economy, whereas, in the old type of machine economy cannot be secured except by the most constant and skillful attention.

Refrigeration secured by these machines is applied to practical service by pumping the brine which has been cooled up to and through the cooling surface which may be placed in the refrigerators to be cooled. Various designs of cooling surface have been developed for use with the machine, a number of which have been developed in this country in adapting the machine to the different conditions existing here. The machine is also arranged so that it starts and stops automatically under the control of the temperatures in the refrigerator being cooled. In this way no power is wasted. When the requirement for refrigeration ceases the consumption of power and water is automatically cut off.

The ice which is made by these machines is made from the same supply from which the drinking water is drawn. As a result, the ice may be placed directly in the water without any possibility of contamination and without the flat taste that distilled water ice has. This ice is invariably opaque, due to the salts and the air which all natural waters carry in solution. For almost all service, however, this opaqueness is of no importance, and when the reason for it is understood there is little objection to it.

There are in the neighborhood of a thousand of these machines in service in France and her colonies, and the American builders of the machines, the H. W. Johns-Manville Co., New York, have now several hundred in service in this country.

Blanchard Marine Oil Engine

The latest design of Blanchard marine oil engine built by the Blanchard Machine Co., Cambridge, Mass., is made in eight sizes, depending upon the work which it has to do. It was designed by Wolcott Remington, who is known the world over for his pioneering work on oil engines, as a real heavy-duty slow-speed engine, designed for constant service and thorough reliability. It runs on kerosene and fuel oils, with a fuel cost less than one-third that of the gasoline engine. The consumption of oil, measuring not over 26 degrees Baume, is guaranteed not to exceed one-tenth of a United States gallon per brake horsepower per hour.

The engine is so arranged that every part is thoroughly accessible. In fact any of the journal bearings, even those between cylinders on six and eight-cylinder engines, can be removed in a few minutes without disturbing any other part of the engine. Great care has been taken in adjusting the weight of the engine so that vibration is an absolute minimum. The starting device is a strong feature, the

engine being started very quickly by means of a blow torch.

The engine is really a modified Diesel, but operates without the very high compression of the Diesel and consequently without danger. The compression is about 220 lbs. per sq. in., instead of 800 lbs. on the older engine. Therefore, the danger of cracked cylinders is reduced to a minimum. The fuel economy approaches that of the Diesel, and is of course far better than that of the gasoline or steam engine.

Ignition is by compression and absolutely positive. The liquid fuel is pumped into the combustion chamber in a fine jet which is broken up into spray and vaporized by contact with the hot cylinder head. This removes all troubles due to delicate, complicated and expensive electric ignition and carburetting apparatus.

A wide range of speeds may be obtained in the Blanchard marine oil engine, for the timing device enables the operator to change at will the time of injecting the fuel, even while the engine is running. This is absolutely necessary in marine work in order to be able to speed the engine up or slow it down and still secure the best results. It also permits a wide range of speed in the boat.

Two of these engines of 100 H. P. each have been fitted to the fishing schooner Knickerbocker, which is now approaching Seattle at the end of her long 16,000-mile trip from Boston by way of the Straits of Magellan. On trial trip these engines gave splendid results, and it is estimated that the daily saving in fuel under full power compared with gasoline will exceed $50, or more than the wages of the entire crew. The engine is of the two-cylinder type and guaranteed to give 45 brake horsepower. It is exceptionally well fitted for service in work boats of all descriptions as well as in pleasure launches.

L. C. Gilman, assistant to the president of the Great Northern railway, with office at Seattle, has been elected president of the Spokane, Portland & Seattle railway and will also act as executive officer of the new steamship company which will operate two passenger steamers, now building, between Astoria and San Francisco.

James W. Hall, Winslow, Wash., has been awarded a contract for building a missionary cruiser for the American Baptist Publication Society. She is to be 52 ft. in length, 11½ ft. beam and will be equipped with a 40 H. P. gas engine.

Dock and Wharf Illumination

The vast sums of money invested in modern vessels make it imperative that every facility be provided for their speedy loading and unloading, as the earning power of a vessel is naturally suspended while it is docked.

For years inventors have worked on machines and methods of speedily accomplishing this end and with wonderful results, but it is only within a comparatively short time that there has been a realization of the importance of proper illumination in this connection.

The condition also obtained in industrial plants until recently when illuminating and efficiency engineers compiled statistics that showed startling results. For instance, it was shown that a substitution of proper lighting for poor lighting increased the efficiency of the workmen in some plants 10 per cent; and a few isolated cases were found where the efficiency, or output, during the time artificial light was used, was increased as much as 25 per cent. Furthermore, it was proven conclusively that the number of avoidable accidents was in direct proportion to diminishing light; and it was claimed by authorities who have made a study of safeguards for the benefit of employes, that 25 per cent of the avoidable accidents were caused by poor illumination.

That which holds true regarding the increased efficiency resulting from the proper lighting of industrial plants also holds good for docks and piers and possibly to a greater extent.

The proper illumination of docks and piers not only materially increases the efficiency of the workmen by enabling them to read the markings on the freight with facility, lighting their way distinctly, etc., but it greatly decreases the liability to accidents. This is a very important item, as the nature of the work which stevedores and freight handlers do is very hazardous.

When the dock is a passenger terminal, proper lighting is of extreme importance from another point of view, as it has an important psychological bearing on the impression given the arriving or departing passenger regarding the services of the line; in other words, plenty of light tends towards cheerfulness. That this feature is important is demonstrated by the modern tendency of railroads to illuminate brilliantly their waiting rooms. Another example is the manner in which merchants brilliantly illuminate their stores, thereby making them cheerful and attracting the crowds.

A recent example of good pier illumination is at the Quebec Steamship Co.'s pier, North river, New York City. This pier is 400 ft. long by 60 ft. wide and is so arranged that boats may be unloaded from either side. Four Type W long life multiple flame arc lamps manufactured by the General Electric Co. have been installed. These lamps are located along the longitudinal center of the building and are approximately 24 ft. above the floor. As soon as it becomes dark the two end lights are turned on and are kept burning all night. When shipments, however, are being unloaded the remaining two lamps are also lighted.

The Type W lamps are especially adapted for this class of lighting because they are an exceptionally high candle power unit and the brilliancy remains undiminished throughout the carbon life. They are very economical to operate, as they burn from 100 to 120 hours without attention, and even then it is necessary to renew only one electrode. The mechanism is extremely simple and the parts are especially treated so that dampness and salt air can have no effect.

Bulletin No. 57, "The Phenix Sight Flow Indicator", recently issued by the Richardson-Phenix Co., of Milwaukee, Wis., illustrates and describes how this unique little device can be inserted in any pipe line carrying a liquid, such as water lines of water cooled transformers and the supply pipes of water jackets of gas engines and air compressors, and how it shows at a glance or indicates electrically by lighting a lamp or ringing a bell when the flow of liquid is interrupted. Several recent improvements in the Sight Flow indicator are also described, showing how it is now possible to adjust the indicator so that it will give an alarm before the liquid stops flowing entirely, that is, when it drops to some pre-determined minimum. This improvement has made it especially suitable for use on water-cooled transformers.

A $2,300,000 dry dock at Norfolk, Va., large enough to accommodate the largest dreadnaughts likely to be built for the American navy was recommended to the house naval affairs committee by Secretary Daniels. His proposal is for a dam the same size as the locks of the Panama canal—1,000 ft. long, 110 ft. wide and 40 ft. deep over all.

The business of the late William Van Vleck Lidgerwood, in London and Coatbridge, England, has been converted into a private limited company under the name Lidgerwood, Ltd.

Changes in Collier's Shape

The Effects of Loading and of Temperature Upon the Hulls of Vessels

NAVAL CONSTRUCTOR S. F. MITH contributed a paper on Change of Shape of Recent Colliers", at the December meeting of the Society of Naval Architects and Marine Engineers, abstracted as follows:

This paper contains the results of observations of hogging and sagging on some of the 500-foot colliers recently built for the U. S. navy. It shows that the upper deck, at the middle of the length, may move up or down as much as 6 in. with reference to the ends, depending on the conditions of loading; and that a temperature rise of 1 degree Fahr. may cause the deck to rise ⅛ in. It contains some observations of the motion of the tank top with reference to the upper deck, and suggests that more extended observations of these points may permit of working backward from the girder deflections and loads to the actual fiber stresses, thus checking the preliminary strength calculations.

John G. Tawresey:—It has been my fortune to have had to do some work along the lines considered in this paper, and as I found the tendency in some quarters to regard it as a needless refinement, I am somewhat surprised to find the subject treated in this paper and brought before the society. I wish that the author had gone on and shown us a way to get around the difficulties which he brings out in the paper.

It is true that vessels bend due to lading and due to other causes, and that bending is a great deal more in some classes of vessels than in others. Colliers are mentioned in this paper. The vessels I had to deal with particularly were torpedo boat destroyers. Then we have car floats, floating drydocks and other structures. I have found on the destroyers, which were of much less strength than the colliers, quite as much change in shape as is reported in this paper. That change was found to be due to the lading, but the lading would not account entirely for it, and further investigation showed that there was a very considerable change due to differences in temperature. The change due to the difference in temperature was, perhaps, over the range of observation I made, two and sometimes three times as much as that due to the lading, but the lading in a destroyer, you must remember, is the weight of her machinery and the weight of fuel oil and different tanks, and the weight of water distributed in certain ways, and the water in the trimming tanks make up the lading to bring the vessel to some desired displacement. The destroyer consists of the machinery, the shell of the vessel, the deck and a few thin bulkheads in between. She is much in the nature of a girder. The bottom flange of the girder is in the water, and must have practically the same temperature as the water, the upper flange is in the air, exposed to the heat of the sun; and we were not very much surprised, when we took observations on a warm day, with the sun beating down on the deck, to find the destroyer hogged. The observations that I took extended over a number of months, and when we did strike a real cold day, we would find that the destroyer, with the same load, was sagged, but she still showed hogging, and to about the same extent. I was unable to construct any curve by which I could project the hogging from the difference in temperature of the water and the upper deck. That was no doubt, due in part at least, to the effect of the lading, and in part to the method of observation not being sufficiently accurate to take account of very small changes.

Passing this part of the subject, it may be of interest to state that I made some investigations on a battleship, and did not find corresponding conditions. The battleship has a great many more decks, the deck that is heated from the machinery lies nearer the neutral axis of the girder, and as far as my observations went I did not find anything corresponding in a battleship to the changes in shape that take place due to changes in temperature on a destroyer. My interest in the matter was not so much in the stresses and the strains as in the displacement. Contract trials of our destroyers are run at a displacement equal to the weight of the boat plus a certain specified lading. A number of the ship builders have constructed at the same time two or more destroyers from the same plan. Some of these destroyers have run more than one trial, and it was a part of my duty to determine the weight of the vessel, the displacement and draught at which the trial should be run, and it is not to be wondered that the contractors and ship builders commenced to ask questions when, a few weeks apart, we would give them a very different displacement at which the trial should be run, when the trial was supposed to be the weight of the vessel plus a definite, specified lading. I might say that every care is taken to examine these displacements as accurately as possible. The draughts are all taken by internal draught gages which, you probably know, consist of a glass tube with a proper seat connection and proper needle valve, to choke off the flow of water, and every precaution is taken to flush the gage out, and be certain that the temperature of the water in the tube and in the pipes leading to it are as nearly as possible to the temperature of the water outside. After determining the draught inside, by checking the displacement off from a small scale curve, we prepare a large diagram that gives the calculated displacement for each inch and this allows us to interpolate and get the displacement very accurately for a fraction of an inch difference in draught. These displacements are checked with the reported weights, and it had heretofore been customary to take any difference between the displacement of the vessel, observe it as accurately as possible, and the recorded weight, and error in the recorded weight, but in taking observations on the vessel, taking one or two early in the morning, and another observation later in the same day, when there was any appreciable change of the weight, and when allowance could be made for what weight had been carried on board or taken off, we would find the displacement was five tons less than the required weight, one time, and the next time 10 or 15 tons greater, on a vessel of 5,000 or 6,000 tons displacement, at the time the observation was made. Consequently we found it necessary to take up this question and attempt to find some way of treating it.

The matter of lading is quite important to the ship builder in running trial trips. Every added ton adds appreciably to the horsepower necessary to be developed to secure any given speed. Also, there is another matter to which I will refer. On the trial trip, in loading the vessel for the run, we found it necessary to take in water for the trimming tank

to get the vessel down to the required displacement, and we took in five or ten tons of water in the trimming tank, to get the required draughts and the displacement, and we found that the displacement increased 10 or 20 tons.

The means which were adopted for the vessels to which I am referring, to observe its changed shape, was to fit an additional internal draught gage, as close between the other two as practicable, which means that the gage was fitted amidships. We then read accurately the draught shown by the three needles, and took the difference between the readings of the middle gage, and the mean of the other two, and that would give us the amount that the ship was hogged or sagged between these two gages. We had a curve, the correction for displacement, the calculated amount to be added or subtracted, in proportion to the difference in reading. Of course, the ship might show the same difference in reading of the gages at different times, the difference in displacement not being the same, that is to say, might not always be bent into the same shape, but any correction of that kind, if you stop to think of the long flat curve, whether a parabola, a circle or a triangle, will give you a nearer result than to correct the curve altogether. That is what we found in a large number of these deck comparisons. There was never a time when the application of that correction did not bring together the results of different observations so that they were much more consistent with one another, and much nearer to the recorded weights.

Amount of Deflection

Ernest H. Rigg:—Mr. Tawresey has given us a very interesting description of the methods adopted on the destroyer to find the amount of deflection and to allow for it in the specifications. It has been my fortune, or misfortune, to have to get that displacement right on some destroyers, to Mr. Tawresey's satisfaction, and we had plenty of fun in doing so. The midship draught gage he refers to in the destroyer, as you all know, comes pretty near the fire room, but in one case it came right in the fire room, and we started to read it under air pressure, and we had some trouble then. After we found that point out, we did not read it under air pressure, and we got along very nicely.

In the discussion on Mr. Rodgers' paper, some reference was made to the shape of the lake vessels. These colliers are similar in type, but single deckers, and anyone who has had anything to do with keeping track of the weights, or anything of that sort, in connection with these vessels, will know at once the difficulties of the situation. As an instance of hogging that takes place, due to difference in temperature, I will cite a case which came to our attention of a car float, 330 ft. long, and lying in the sun with nothing on her at all. We tried to get a check of the weight. We found they were not anywhere near what they should be. We discovered that the sun was strong and the water was cool. We took a transit and shot a line along, and found a hog of 8 in. in what should be a straight line. These deflections had taken place, and I think it is valuable and important that we should devise means of getting on to that. The midship gage is of practically little value in the trial trips, where weight is particularly important. As Mr. Tawresey said, a slight increase of weight on a destroyer means a whole lot of horsepower at 30 knots.

Draughts and Hogging

Joseph H. Linnard:—I think Mr. Smith's paper will call more generally to the attention of ship builders the great importance of this temperature question with reference to draughts and hogging, and other phenomena, that are exhibited under the influence of temperature. I have had some experience in the past in that matter, and the one that particularly drew my attention to it was the case of the tests of a floating drydock that was built for the government some years ago and tested in Chesapeake bay. The contract required that two very heavy ships, one of the short type of a battleship, and the other of the long cruiser type, should be docked and the deflection of the dock ascertained under the conditions in which certain maxima deflections were not to be exceeded. We found that our time was very limited, owing to the circumstance of the service of the ships, and the members of the board of civil engineers who had established very exact lines for the ascertainment of these deflections were, of course, limited as to the times when they could take their observations, although they had established transits and sight stations in the most careful manner. And on taking these observations inexplicable deflections were observed, such as were utterly contrary to what would have been expected judged by the results of the loading of the deck or the ship. We devoted considerable thought to the matter, and we came to the conclusion, after some calculations, that it was probable that the temperature distortion, that is, the distortions due to temperature in the upper member of the floating dry dock, subject to the hot sun, were greater than the deflections in the known strength of the dock, due to the loading of the dock or the ship.

Francis B. Smith:—We are very much interested in this subject of the hogging and sagging of ships in loading and carrying their load. Our company is going to a good deal of expense at the present time in making tests in connection with this matter, and I am interested in getting all the information I can. Our ships are long and flat, single deckers. They are pretty high for the dock we have to load from, loading iron ore, so, as a consequence, we have to begin from the back end of the ship to load, and work forward as she goes down, as the ship is too high forward for the height of the spouts. We begin at the back end and take every other hatch as we work forward. The hatches are 12 ft. centers, and when we do this we do not have any bad effects, that is, we can load our ship pretty nearly in shape, but sometimes they put a little too much freight in midships, before they get clear forward, on account of the bow being so high for the spout. The boat gets sagged this way in the middle, and after she once gets a sag in there we cannot get it out. We have to be very careful to see that they do not get this sag at all in being loaded. That is a point I would like to get all the information on that I can.

Herbert C. Sadler:—I ask the last speaker if he has actually measured the amount of sag in his vessels, and what he considers to be the maximum permissible sag? I think it is, perhaps, generally noted that the lake freighters have draught marks amidships as well as at each end. I think any information of that kind would be valuable, as to the maximum amount which is observed in any case, and its effect on the ship.

Destructive Effect on Hull

Francis B. Smith:—We had a very serious case during the last season, where the ship, when loaded, had the same draught at midships, and drew a foot less forward, and it had quite a destructive effect on the hull of the ship and loosened up a great many rivets. Usually, we do not calculate to get more than 2 or 3 in. sag in the middle.

Francis T. Bowles:—I would suggest that the practical value of this paper would be much enhanced if either the author or Mr. Tawresey would add to their remarks an exact

description of the most accurate method of laying off the draught marks on a vessel, and of correcting it when the vessel is loaded. I am aware that there are some tricks in both of these businesses.

T. G. Roberts (communicated):—I am glad the author of this paper has introduced the curves showing conditions on the Nereus, which were prepared under my direction at Newport News. I may also add that similar curves were previously prepared by me in the case of the collier Proteus, the results of which were quite similar to those shown for the Nereus. The Proteus being the first of these two vessels to be completed, I prepared these curves without any knowledge that similar data was being, or had been, taken in the case of the Sparrows Point colliers; and the purpose I had in view was to be able to account for an anticipated difference between the weights taken of the different parts prior to incorporation into the vessel, and the displacement as determined from the draught marks at completion. It struck me that the condition of bending actually found would be reasonable to expect, which the subsequent observations confirmed. I forget now how much the displacement was affected by the observed difference between the loaded condition under sag and the designed condition with keel flat as in dock, but I think it was something like 180 tons. Anyhow it was an appreciable difference to account for when the weights and the displacement are being compared, or when the conditions at the trials are being met. Since the contract for the vessels required the work to be according to the best merchant practice, there was no provision for expenses to the Newport News Ship Building & Dry Dock Co. and to William Gatewood for volunteering to supply the necessary facilities to enable this work to be conducted by the force of my office.

Shores Dropped Out

Richard M. Watt:—Merely as a matter of interest, I would ask attention to an experience of my own many years ago, when I was assistant to Admiral Bowles, in the navy yard. He assigned me the task of hauling out seven torpedo boats. They were small in size, and the longest, as I remember, was 160 ft. The vessels were hauled out with improvised ways, and I noted with some consternation on arriving at the yard one morning that the shores we set up under the fourth one had dropped out during the night. This was almost beyond my comprehension at that time, but, of course, the only thing to which it could be ascribed was to temperature changes.

Adjournment was then taken for luncheon.

Banquet of Naval Engineers

The date of April 25, 1914, has been selected by the American Society of Naval Engineers for the annual banquet of the Society, which will be held in Washington, D. C. The following committee has been appointed to have charge of the arrangements for the banquet:

Rear Admiral J. R. Edwards, U. S. N.; Capt. Gustav Kaemmerling, U. S. N.; Capt. C. A. McAllister, U. S. R. C. S.; Lieut.-Com'rd H. C. Dinger, U. S. N.; Lieut.-Com'dr J. B. Gilmer, U. S. N.

It is expected that an important feature of the banquet this year will be a discussion of the important position that producers of naval material hold in relation to the potential naval strength of the country and the desirability for best co-operation and interchange of views between the civilian engineering personnel of the country and the naval service.

The membership of this society includes, besides naval officers, the important members of the engineering staff of practically all firms engaged in the development and production of naval material, and the engineering staff of engineering and technical colleges of the country.

An interchange of opinions as to the securing of the best conditions for the production and upbuilding of our naval material and the development of the engineering forces of the country as an adjunct to our naval strength is believed to be an appropriate spirit to govern the assemblage of the members of this society.

Naval Program

The house committee on naval affairs has approved the administration's two battleship program. As reported to the house, the bill awards $140,200,000 exclusive amounts to be spent for armor and armament and fixes the building program for the coming fiscal year as follows: Two first class battleships, $7,800,000 each, exclusive of armor and armament; one 1,100-ton, 21-knot sea-going submarine, $1,100,000; six torpedo boat destroyers, $925,000 each; three coast defense submarines of 500 tons each, $620,000, designed for use on the Pacific coast; four harbor defense submarines of smaller type, $375,000 each, intended for use on the Gulf coast and Panama. The bill provides that the defense submarines shall be built and maintained on the Pacific coast provided that they can be built there as cheaply as they can be built on the Atlantic coast and "laid down" on the Pacific coast.

Eckliff Boiler Circulators

The Eckliff Automatic Boiler Circulator Co., of Detroit, has just received a contract from the Great Lakes Dredge & Dock Co., of Chicago, to equip 15 vessels with the Eckliff circulator as a result of a test held on the tug McCarthy. Orders have also been received from the Coastwise Transportation Co., of Boston, to equip two boilers on the steamer Suffolk with the circulator. It is also being installed on the vessels of the Union Sulphur Co.'s fleet.

The first Eckliff circulator that was put into service was installed in the boiler of the steamer Pentland in 1910. It was a crude installation compared with present design, but it has proved that the principle involved was correct. At the time the installation was made the Pentland was owned by the Spring Lake Iron Co., carrying ore. She is now a lumber carrier and is owned by Fred Leckis, Rockefeller building, Cleveland. When the circulators were put into this boiler, the Adamson furnaces showed several cracks and the lower half of the boiler was in such condition that the owners expected that a new boiler would have to replace the one in the Pentland inside of a year or two, but it is still producing steam for this steamer. The circulator shows no evidence of four years' service, and Mr. Leckis says that the boiler is good for ten years' additional service. The boiler is today free from scale or dirt on any of the heating surfaces, as was recently proved by an inspection by the steamboat inspection service.

It is proposed to hold a colonial exposition at Demarang, Java, from September to November, 1914, to celebrate the centennial of the return of the Dutch East Indies to Dutch rule. The exposition is under the patronage of the governor general of the Dutch East Indies, and the American representative is T. Greidanas, 136 Water street, New York.

The McMyler Interstate Co., Bedford, O., is installing at the Gerard Point terminal of the Pennsylvania railroad an ore unloading plant having two grabs of three tons each.

Gas Producer Boat

The Clooney Construction & Towing Co., Westlake, La., built for themselves for inland towing, the gas boat Dart, 50 ft. long, 10 ft. beam and 5 ft. deep, equipped with a 50 H. P. Wolverine engine and 50 H. P. Galusha producer gas plant. The company reports that the fuel cost of this producer gas plant is approximately one pound of coal per horsepower per hour, which represents an enormous saving over either gasoline or kerosene. In the company's estimation the only thing that can be said against the producer gas plant is that it does not develop quite the horsepower that the engine would on gasoline, but this difference is not over 5 per cent in the company's experience.

During the past year the company built the quarantine boat Alice for use at Galveston, 80 ft. long, 16 ft. beam and 7 ft. deep, equipped with 100 H. P. Standard Motor Construction Co.'s engine and an auxiliary lighting plant.

The company also built a gas tow boat named Aransas for the Aransas Pass Channel & Dock Co., Aransas Pass, Texas. This boat is 50 ft. long, 12 ft. beam and 4½ ft. deep, and is equipped with two 27 H. P. Wolverine engines driving twin screws. The tow boat is used in towing cotton barges.

They also built the gas boat Freda for the North American Land & Timber Co., Lake Charles, La., 46 ft. long, 10 ft. beam and 4½ ft. deep, equipped with a 36 H. P. Buffalo engine. This gas boat is used in towing rice on the Calcasieu river and tributaries.

They also built the two-masted schooner Cobos, 108 ft. long, which has an auxiliary equipment of a 65 H. P. Wolverine engine. The schooner was especially built for the oil trade with Mexico.

They also built the steam tug Arletta, 80 ft. long, 18 ft. 6 in. beam and 6 ft. 10 in. deep, equipped with a Morris Machine Works 150 H. P. steam engine and boiler.

Orders for McNab Specialties

During his recent visit to the lakes, Alexander McNab, vice president of the McNab Co., Bridgeport, Conn., secured orders from M. A. Hanna & Co., of Cleveland, for six sets of Cascade boiler circulators; from the Wisconsin Steel Co., of Chicago, for six sets; from Capt. W. C. Richardson, of Cleveland, for ten sets, and from Boland & Cornelius, of Buffalo, for 26 sets. The Vance & Joys Co., Milwaukee, also ordered two sets of direction pilot house indicators, M. A. Hanna & Co. two sets of indicators and pneumatic counters, and W. C. Richardson & Co. one set of direction indicators. The new steamer building for the Calcite Transportation Co. at the yard of the Great Lakes Engineering Works, will be equipped with McNab pneumatic counter, McNab steamship draft gage and McNab direction indicator.

Radio Stations

Engineer-in-Chief Robert S. Griffin, U. S. N., in a statement submitted to the house committee on naval affairs, announces that the navy department has changed its proposals for establishing a chain of radio stations to complete wireless communication between Washington and the Philippines. Wireless stations at Guam and Samoa are to be eliminated if possible and high power stations will be located at Panama, San Diego, Cal., Honolulu and Manila. The station at the Isthmus, which will be situated at Darien, will be completed, according to present prospects, in January, 1915. It is expected that the Arlington station will be able to communicate directly with Darien. Recent experiments at the Arlington radio station showed that it was able to pick up messages sent from a Poulsen arc set of radio instruments at Honolulu, and tests recently conducted at San Francisco, with a Poulsen set demonstrated that messages could be sent direct from San Francisco to Washington.

Bids for Dredges

Bids were opened by the United States Engineer at Galveston, Jan. 14, to construct two hydraulic dredges to be used in the Houston ship channel. The dredges are to be named Sam Houston and San Jacinto. Each will be 165 ft. long and both are to be delivered within ten months of the awarding of the contract. They are to be equipped for hydraulic dredging and fitted with all necessary pumping machinery, quarters for officers and crew, and other appurtenances. The proposals were submitted for one or both dredges, for delivery at the ship yards and for delivery at Galveston. The bids were: Bowers Southern Dredging Co., Galveston, for both dredges at yards, $316,000; delivered, $321,000. Atlantic, Gulf & Pacific Co., New York, dredge A, $267,000; dredge B, $260,000; both dredges, $527,000; delivered, $534,000. The Norbom Engineering Co., Philadelphia, dredge A, $164,000; dredge B, $161,500; both dredges, $320,000; delivered $323,500. Theodore Smith & Sons Co., Jersey City, N. J., dredge A, $183,000; dredge B, $178,000. Bucyrus Co., South Milwaukee, dredge A, $185,000; dredge B, $177,500; both dredges, $348,500; delivered, $354,000. Ellicott Machine Corporation, Baltimore, dredge A, $169,400; dredge B, $165,900; both dredges, $325,300; delivered, $237,800. An appropriation of $400,000 is available for the building of the two dredges. Of this sum $200,000 was appropriated by the United States conditional upon Harris county contributing a like amount.

Transport and Supply Ship

Contracts have been awarded to the Boston navy yard for the construction of a supply ship at $1,171,713, and the Philadelphia navy yard for a transport at $1,458,305. While these bids were somewhat below those sent in by private contractors there is no doubt whatever that the government will pay more for the vessels than if they had been built by private contract. To begin with a great deal of yard equipment will have to be purchased in order to enable the navy yards to build the vessels at all.

More than 20 concrete piers built several years ago by the Aberthaw Construction Co. and submerged in the United States navy yard at Boston, are again being examined to note the action, both mechanical, due to frost, and chemical, due to ingredients in the sea water. As this subject is one which has a large bearing on the permanence of piers, abutments, sea walls, etc., when built of concrete, these experimental tests are expected to yield some very valuable results.

Secretary Daniels, of the Navy Department, has awarded contracts for the construction of three submarines at the cost of $535,000 each. Two will be built by the Electric Boat Co. at the yard of the Fore River Ship Building Corporation, Quincy, Mass., and the third will be built at one of the navy yards under the supervision of the Lake Submarine Boat Co.

The New Jersey Lake Ship Canal Association has been organized to arouse interest in the movement for a sea level ship canal across the state of New Jersey connecting New York harbor with the Delaware river. The incorporators are: Raymond G. Potter, Passaic, N. J.; Charles R. Clark, Little Falls, N. J., and Edward L. Behn, New York City.

Obituary

Joseph Sellwood died at his home in Duluth on Tuesday, Feb. 24, of Bright's disease. He had been in rather poor health for the past two years but his condition was not regarded as serious until about Christmas last. Captain Sellwood was one of the pioneers of the northwest and a self-made man in every sense of the word.

He was born at Cornwall, Eng., Dec. 5, 1846, where he had been employed in the tin mines. He came to this country alone in August, 1865, and within two months thereafter went into the Lake Superior iron country, securing employment at the old Ogema mine, now a part of the Maas mine in Ontonagon county, Mich. He remained in the copper country until 1870 and then entered the employ of the New York Mining Co., operating at Ishpeming on the Marquette range. It was not long before he began contracting to mine ore by the ton, hiring his own men. Beginning with a part of the old New York mine, his contracts grew until they embraced most of the mining at the New York and Cleveland mines, in which Samuel J. Tilden had a considerable interest. Notwithstanding his great activities in iron mining, he also found time to establish a general store at Ishpeming which still operates under the name of Joseph Sellwood & Co.

When the Gogebic district began to be explored, Mather, Morse & Co. sent Sellwood to open the Colby mine. He also opened the Brotherton mine for Pickands, Mather & Co. on the Gogebic range. Mr. Sellwood had an inherent ability to mine at low cost, and was among the first to see the advantage of the steam shovel proposition. Mr. Sellwood later organized the Brotherton Mining Co., in which he acquired a one-fourth interest, becoming president of the company. This ownership continued until the sale of the property to the Lackawanna Steel Co. Sellwood then obtained a lease on the Sunday Lake mine. In 1886, Mr. Sellwood went to Minnesota and opened the Chandler mine for the Chicago & Minnesota Ore Co., dividing his time between the Vermillion and Gogebic ranges. Captain Sellwood remained at the Chandler mine until April, 1892, when he went on to the Mesabi range to pick up properties for the Minnesota Iron Co., and as a result of his explorations the company bought the Norman, Fayal, Auburn, Genoa, Iron Chief, Moose, Canton and Cloquette mines, all of which are now held by the Steel Corporation.

In 1898, Mr. Sellwood left the Minnesota Iron Co. to look after the ore interests of the American Steel & Wire Co. In the interests of this company he opened the Sauntry, Alpena, Clark and Chisholm mines on the Mesabi range, the Atlantic on the Gogebic range, the Moore on the Marquette range, and the Cuff mine on the Menominee. When the Steel Corporation was formed, Sellwood left the employ of the American Steel & Wire Co. in order to pick up properties for himself and independent interests, in which he was eminently successful. He gradually branched out into other lines of endeavor and was president of the City National Bank of Duluth, the First National Bank of Ely, the Bank of Two Harbors, as well as being the controlling factor in the First National Bank of Bessemer, Mich. During the latter part of his life he also went into vessel property, building the steamer Joe S. Morrow, naming the vessel after his young grandson. He leaves a widow, two daughters and a son, Mrs. Charles L. Mershon, Mrs. L. W. Leithhead and Richard M. Sellwood.

The Chamber of Commerce and Merchants' Association of Honolulu, gave an elaborate welcome to the steamship Matsonia, of the Matson Navigation Co.'s fleet at Honolulu on Feb. 2. Several addresses were made. J. A. Kennedy, president of the Inter-Island Steamship Co., made an address in which he predicted the rapid development of the port of Honolulu after the completion of the Panama canal. Mr. E. Faxson Bishop, president of C. Brewer & Co., of Honolulu, traced the development of the Matson Line.

The Kingsford Foundry & Machine Works, Oswego, N. Y., has received from the Isthmian Canal commission a contract for 14 Kingsford high efficiency centrifugal pumps aggregating 2,200 H. P. for the permanent pumping stations at Miraflores and Ancon. All these units will be equipped with Kingsford's auto-water balancing devices, the government accepting the same in place of the marine thrust bearings originally specified.

J. A. Martinolech, Dockton, Wash., is building a passenger steamer 135 ft. long, 23 ft. beam and 8 ft. deep, for the Washington Steamboat Co., Seattle.

Marine Patents

Copies of any of these patents can be obtained by sending 15 cents in stamps to Siggers & Siggers, patent lawyers, Suite 11, National Union building, Washington, D. C.

1,087,162—Marine Propulsion Mechanism. Ole Evinrude, Milwaukee, Wis., assignor to Evinrude Motor Co., Milwaukee, Wis.

1,087,203—Propeller. Julius William Walters, Glens Falls, N. Y.

1,087,273—Internal Combustion Engine. Howard B. Burr, Mason City, Ia., assignor by mesne assignments, to Chase Mfg. Co., Mason City, Ia., a corporation of Delaware.

1,087,352—Life - Saving Apparatus. John C. Cox and Lowry Arnold, Atlanta, Ga.

1,087,387—Lubricating Means for Two-Cycle Internal Combustion Engines. Hermann Lemp, Lynn, Mass., assignor to General Electric Co., a corporation of New York.

1,087,566—Internal Combustion Engine. Hugo J. Bachman, Denver, Col.

1,087,660—Emergency Ship Brake. John H. Hyde, Tacoma, Wash.

1,087,681—Internal Combustion Engine. Washington I. Phifer, Collinsville, Ill.

1,087,858—Life Boat Toboggan. William H. Wickham, Seattle, Wash.

1,086,390—Buoyancy Device for Canoes, Boats, etc. Uriah R. Miller, Salem, O., assignor to the W. H. Mullins Co., Salem, O., a corporation of Ohio.

1,086,608—Skimming Propeller Skee. Thomas C. Moore, San Pedro, Cal.

1,086,791—Internal Combustion Engine. Karl Steinbecker, Charlottenburg, Germany, assignor to General Electric Co., a corporation of New York.

1,086,792—Internal Combustion Engine. Karl Steinbecker, Charlottenburg, Germany, assignor to General Electric Co., a corporation of New York.

1,086,793—Internal Combustion Engine. Karl Steinbecker, Charlottenburg, Germany, assignor to General Electric Co., a corporation of New York.

1,086,953—Internal Combustion Engine. Percy George Tacchi, Acton, London, Eng.

1,086,989—Marine Safety Device. Maurice Bouchet, Paris, France.

1,087,057—Ship Protector. Shirley Hay Wood, Corsicana, Tex.

The Japanese house of representatives has adopted the budget providing an appropriation of $62,000,000 spread over five years for the expansion of the navy.